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ABSTRACT

Designed to supplement curricular programs dealing with the human body, this booklet offers an activity-based, student-oriented approach for middle school teachers and students. Twelve activities focus on principles and skills related to the respiratory, circulatory, and skeletal systems. Each activity consists of student sheets and a teacher's guide. The teacher's guide contains information on the activities including: (1) topic area; (2) introductory statement; (3) math and science skills; (4) required materials; (5) key questions; (6) background information; (7) management details; (8) instructional procedures; (9) student procedures; (10) discussion questions; (11) activity extensions; and (12) curriculum coordinates. (ML)

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FROM HEAD TO TOE

Respiratory, Circulatory, and Skeletal Systems

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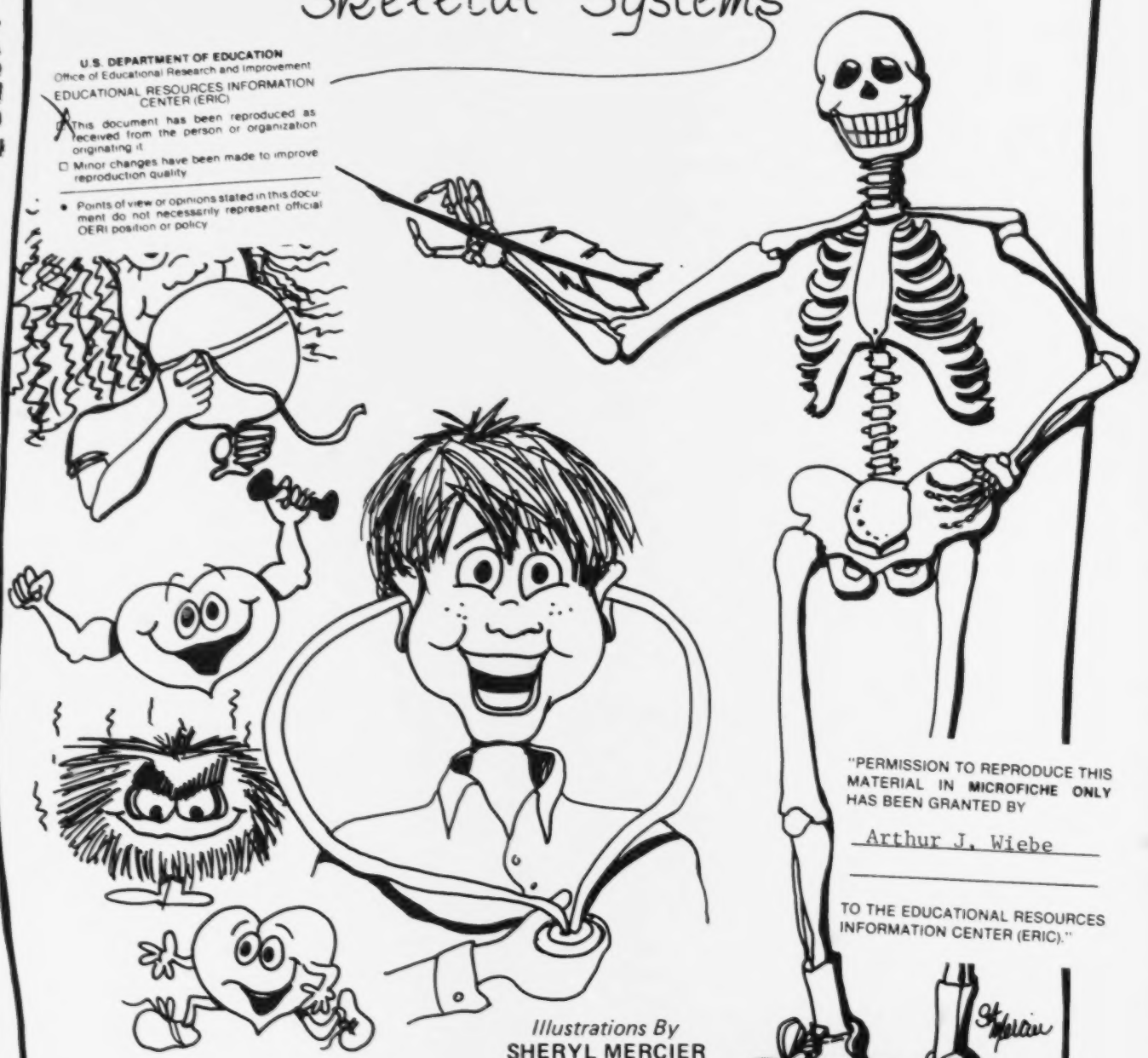

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Book 3

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FROM HEAD TO TOE

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Project AIMS

Project AIMS has as its purpose the integration of subject matter in K-9. Such integration enriches and makes learning meaningful and holistic. Project AIMS began as a program to integrate mathematics and science, but has since developed to also include language arts, social studies, and other disciplines. The acronym "AIMS" stands for "activities to integrate mathematics and science."

Project AIMS is a continuing, non-profit project of Fresno Pacific College. It had its inception in a National Science Foundation funded program to train teachers in the integration of mathematics and science. This quickly created the necessity to write instructional materials incorporating this concept. Despite the fact that thoughtful educators have long recommended this approach, very little appropriate material was available.

Currently, Project AIMS is funded solely through the sale of this developing series of books. All net proceeds from their sale flow into a trust fund administered by Fresno Pacific College. The use of this fund is restricted to the support of continued research and development, partial scholarships for classroom teachers who participate in the writing and field testing teams, and the publication of the books.

Two writing teams have completed their work. The first consisted of seventy-five teachers in grades 5-9 who met over a period of eighteen months. The second involved thirty-five K-4 teachers who wrote during a two-year span. In the fall of 1985 a third team of approximately fifty teachers in grades 2-9 will begin writing. In addition, over a hundred teachers have been involved in field testing newly created materials.

The rationale for this integrative thrust lies in the fact that science, mathematics, language arts, social studies, etc., are integrally interwoven in the real world outside the classroom, from which it follows that they should be similarly treated in the classroom if we are to prepare our students for life in that world. Teachers who have used Project AIMS lessons give enthusiastic endorsement to the effectiveness of this approach.

Science encompasses the art of questioning, investigating, hypothesizing, and discovering. Mathematics is the language that provides clarity, objectivity, and understanding. The language arts provide us with powerful tools of communication. Many of the major contemporary issues involve societal issues stemming from advancements in science. It is time, therefore, that all of us in the teaching profession take seriously using a more holistic mode of transmitting knowledge to students. It is this that motivates all of us who are involved in creating or using the integrative materials of Project AIMS. We invite you to join us in this effort.

Extensive field testing of these materials confirms the following beneficial results.

1. Mathematics becomes more meaningful, hence more useful, when it is applied to situations that interest students.

2. The extent to which science is studied and understood is increased, with a significant economy of time resulting from the integration of two or more disciplines.

3. There is improved quality of learning and retention, supporting the thesis that learning which is meaningful and relevant is more effective.

4. Motivation and involvement are increased dramatically as students investigate real world situations and participate actively in the process.

We invite you to become part of this classroom teacher movement by using an integrated approach and by sharing any suggestions you may have or investigations you would recommend. Project AIMS welcomes you!

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I HEAR, AND I FORGET

I SEE, AND I REMEMBER

I DO, AND I UNDERSTAND

–Chinese Proverb

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FROM HEAD TO TOE
Respiratory, Circulatory, and Skeletal Systems

INTRODUCTION

In the development of this book and workbook we have sought to utilize an activity-based, student-oriented approach. Our sole purpose is to add a spark to your science and math programs. Each activity is a carefully tested and useful tool for developing both scientific and mathematic principles and skills. The investigations are intended as a supplement which can be used in conjunction with any science or health text which deals with the human body.

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The AIMS Education Foundation is a non-profit, tax exempt corporation. All net proceeds from the sale of Project AIMS materials are used to sustain its program of research, development, publication, dissemination and education.

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INTRODUCTION

The selections "Are You Mean (x)," "Corpus Allaroundus," and "Dem Bones" are intended to be used as a unit. The basic information in the first activity is used to provide an information bank for the next activities. The diagram developed in the selection "Corpus Allaroundus" is utilized as the base for "Dem Bones." The outline can also be used in the development of all of the other portions of the human body. The drawings and diagrams can be made proportional and fitted into the appropriate place. Activities listed in the extensions can be utilized as independent or group research.

What is the Average Student Like?

I. **Topic Area**

The Average Student

II. **Introductory Statement**

The learner will utilize the information gathered from the measurement of his/her body to construct a personal chart and provide data for the development of class graphs.

III. **Math Skills**

a. Graphing
b. Charting
c. Computing percent
d. Measuring in metric units
e. Measuring in conventional units
f. Averaging
g. Estimating

Science Processes

a. Collecting data
b. Analyzing data

IV. **Materials**

Tape measure (metric and conventional)
Pencil
Student worksheets, pages 1-8

V. **Key Question**

"What is the relationship between the individual and class norms?"

VI. **Background Information**

This is an introduction to metric measurement and the proportion of the human body. It is also an effective technique to introduce the students to an anatomy study. The students will also participate in a graph development process. Each student may be given a body part to graph and build a graph for that body part. The student should discover that there is a relationship between the individual and the group (bell curve).

VIII. **Procedure**

1. Each student will estimate his/her measurement in metric units.
2. The students will pair up and, using a metric tape, measure each other's bodies and record the measurements.
3. Construct graphs, using the attached form (page 4), for each area on the form (eye color, hair color, weight, height). The graphs may represent all students, only boys, only girls, or only certain ages. Bar, composite, solid-line, or broken-line graphs may be constructed for comparison of different groups.

X. **Discussion**

1. Can you find proportional relationships between body parts?
2. Can you find any patterns in statistics (boys, girls, age, etc.)?

XI. **Extension**

1. Develop graphs utilizing different characteristics.
2. Develop graphs utilizing different groups or clusters.
3. Develop graphs utilizing differences between estimates and actual measurements.
4. Develop statistical analyses of relationships between height and various body parts.

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CORPUS All AROUND US

I. **Topic Area**
Human Body Perimeter

II. **Introductory Statement**
This exercise introduces the student to the basic perimeter of his/her body.

III. **Math Skills**
a. Using ratio
b. Charting

Science Processes
a. Observing
b. Measuring
c. Predicting and estimating
d. Recording data
e. Generalizing

IV. **Materials**
One roll of white butcher paper
Six rolls of masking tape
Scissors
Paper clips (two per student)
Pencils and erasers
Black felt-tip pen for each student
Student worksheets, pages 9-10

V. **Key Question**
"What does my body 'outline' look like?"

VII. **Management Suggestions**
1. Teacher will cut sheet for each student.
2. Paper should be rolled, not folded, and paper clipped on ends.
3. Edges of paper should be taped with masking tape all around, both front and back.
4. Pencil should be held perpendicular to paper at all times during outlining procedure.
5. The original outlining should be given as homework, since the most accurate body outline requires a minimum of clothing.
6. Penciled outline should be clean, firm lines before finalizing it with black felt tip pen.

VIII. **Procedure**
Day One
1. Each student estimates own height and adds one meter to it.
2. Teacher measures and cuts paper according to this estimate.
3. Student tapes with masking tape the edges of his/her paper.
4. Student rolls and paper clips his/her sheet.
5. Student immediately puts name on outside of roll to help identify it at end of day.
6. Student takes roll home.

Homework
1. Unroll paper on clean, hard, flat surface and tape it down.
2. Student lies on back, centered on paper by family helper, arms extended at a minimum of 15 degrees, maximum of 45 degrees from body. Backs of hands are placed flat on the floor, fingers spread. Legs should be slightly spread and right foot turned so that outer edge is flat on paper. Head should be turned to the right.
3. Family helper proceeds with outlining the body, remembering to keep pencil perpendicular to paper surface at all times.

Day Two
1. Roll is returned to class.
2. Teacher examines each outline.
3. Students make final, firm-penciled outline.
4. Teacher distributes black felt-tipped pens.
5. Students carefully trace over the finalized outline.
6. Student originates a title to be put at the center. Student also pens name, class and date at bottom right.

Day Three
Using his/her own body outline, student measures with metric units and records the listed dimensions on student worksheet page 9.

X. **Discussion**
List and discuss the ratios and porportions of the listed body parts.

XI. **Extension**
1. Develop chart(s) from list of body parts ratios/proportions.
2. Measure your standing height and compare it to length of body outline. What factors might affect differences?
3. Determine the average of girls' heights and average of boys' heights. Is there a difference? Why?
4. Compare your measurements to the "Golden Proportion." See below* and student worksheet, page 8.

*"The Golden Proportion" The Anatomist is able to compute the stature of the individual by a formula based on the length of the thigh bone. Statistics show that the height of a man will be 1.88 times the length of this bone, plus 813.06 millimeters. In the female the figure is the length times 1.945 plus 728.44 millimeters. This formula may be applied to any human from the time of the ice age down. From ***Our Human Body***, ©1962, Wilton Krogman.

'DEM BONES'

SKELETON

THE FRAMEWORK OF THE BODY

I. **Topic Area**
The Skeletal System

II. **Introductory Statement**
This activity will enable the students to visualize what the average skeletal system looks like.

III. **Math Skills**
a. Using ratio/porportion
b. Charting
c. Graphing
d. Averaging
e. Measuring

Science Processes
a. Observing
b. Measuring
c. Predicting and estimating
d. Recording data
e. Applying and generalizing

IV. **Materials**
Metric tape measures
Metric ruler
Meter stick
Butcher paper (lots)
Colored pencils—red, yellow, brown
Felt-tip pens, both fine and wide
Scissors
Pencils and large erasers
Student worsheets, pages 11-20

V. **Key Question**
"What does your skeletal system look like?"

VII. **Management Suggestions**
1. Be sure that your students know how to label as on worksheet page 13.
2. Stress that the initial sketch should be done lightly, as some corrections will be necessary. Perhaps use No. 4 pencils.
3. Be particularly careful about pairing students to avoid possible problems—girls with girls...

VIII. **Procedure**

Days 1-2
Follow procedure in Corpus Allaroundus, page 34, or use outlines students made during that activity. Outlining can be done at school if you pair girls with girls and boys with boys.

Day 3
1. Have students review the framework and bone structure of the human body, student worksheets pages 13-20.
2. If desired, take measurements required on student worksheets pages 11-12.
3. Referring to pages 13-20 and measurements taken in step 2, lightly sketch in the bone structure. (Note: pay particular attention to male and female pelvic differences, student worksheet page 20.)
4. Check each student's work for approximate accuracy.
5. Have students label the bones. Review with students proper labeling techniques: neatness, straightness and accuracy.
6. Finalize drawings.

X. **Extensions**
1. Extend drawings to include flexions, ligaments, tendons and joints.
2. Seek Golden Ratio.
3. Prepare reports on bone groups, etc.

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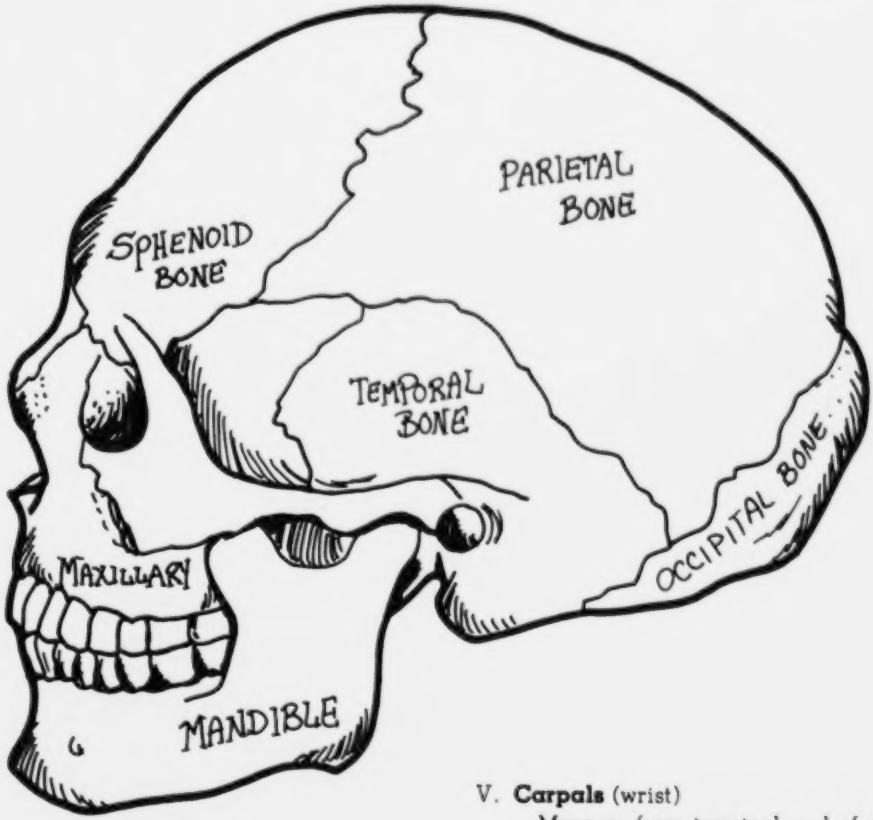
SIDE VIEW OF SKULL



I. **Cranium** (skull)

Materials: two rulers and 8'-10' string.

Procedure: (1) Tie string to one end of the ruler—allow string to hang freely. (2) Place ruler #1 on top of head and allow string to hang downward until it touches nose. Use ruler #2 to measure from string to back of head. (3) Measure from base of ear lobe to top of head. (4) Measure from base of mandible (lower jaw) to top of head. This will give you enough measurements that when used in conjunction with mimeograph sheet should allow students to draw their own cranium.

II. **Humerus**

Measure from top of upper arm on outside of shoulder to bend of elbow. Starting point may be found by placing fingers on top of shoulder and slowly raising the arm. You should be able to feel terminal end of humerus rotate.

III. **Radius-Ulna**

Measure from bend of elbow to bend of wrist.

IV. **Phalanges** (fingers, toes)

Each joint can be measured at the joint crease.

V. **Carpals** (wrist)

Measure from terminal end of radius-ulna to base of palm (metacarpals); base of thumb to heel of hand (fleshy part of palm). Remember there are eight (8) bones which make up the carpals (wrist).

VI. **Metacarpals** (palm)

Measure from knuckle to an imaginary line at base of third joint of thumb and to fleshy part of palm at base of little finger.

VII. **Femur**

Measure from point where hip bends when leg is swung away from body to where leg bends at knee. Width at knee may be measured by placing two flat pieces of wood on each side of knee and measuring distance between (be careful to keep wooden pieces straight up and down).

VIII. **Patella** (kneecap)

Measurement accomplished by laying ruler on patella and measuring in two or three directions and drawing an enclosed arc between measurements.

IX. **Tibia-Fibula**

Measure from base of bended knee to bend in ankle. Upper width equals base of femur and forms an opposite-formed bone joint.

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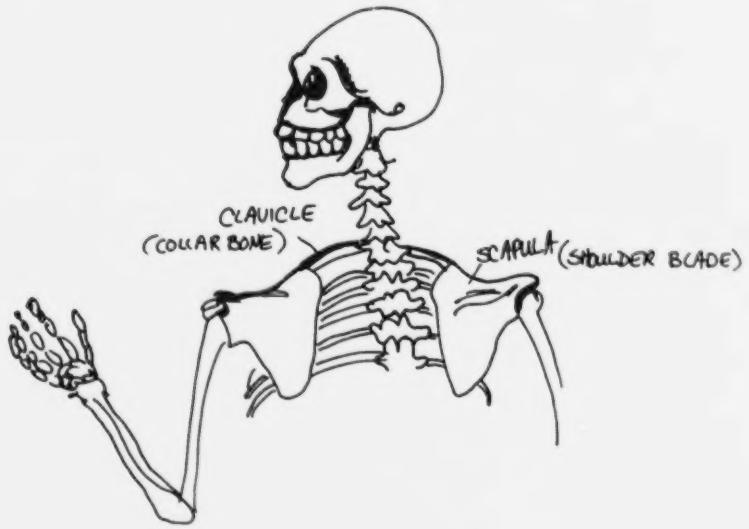

X. **Metatarsals** (foot)

Measure from base of phalanges (toes) to bend in ankle.

XI. **Tarsals** (ankle)

Measure from heel to area where ankle bends. These bones fit between terminal ends of tibia-fibula which forms what is commonly called shin bones.

XII. **Pelvis**

Measure width from hip bone to hip bone. Base of pelvis is one half upper width. Gap between hip bones where spine connects to ilium-coccyx (backbone) is one-fourth upper width. Base of pelvis is one-fourth of lower width.

XIII. **Spine**

Cervical vertebrae are measured from base of skull to shoulders; remainder from shoulders to where you bend at the waist. Measure from dorsal (back) side rather than the ventral side.

XIV. **Clavical** (collar bone)

Measure from terminal end of shoulder to sternum (breast bone).

XV. **Scapula** (shoulder blade)

Using hand, place thumb on upper edge of shoulder blade and spread fingers until you are able to reach lower portion. Measure distance between spread. Width is determined by same method only from top of shoulder blade to base (see insert).

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ARM YOURSELF

I. **Topic Area**

Muscle Strength (Arms and Shoulders)

II. **Introductory Statement**

Students will be able to compare the muscle strength of their arms and shoulders to that of their peers, within the same age and sex.

III. **Math Skills**

a. Averaging
b. Formulating

Science Processes

a. Classifying
b. Recording data
c. Analyzing and generalizing

IV. **Materials**

Pencils and paper
Chairs
Partner for recording
Student worksheets, pages 21-23

V. **Key Questions**

"How strong are you? How do you compare with others your own age?"

VI. **Background Information**

Chair push-ups are done in the following manner:

1. Student places chair against wall.
2. Student stands facing the chart and places hands on front edge of the chair.
3. Student places feet back so body is at 45° angle to the ground.
4. Arms straight and perpendicular to the body, back should be straight.
5. Student lowers himself/herself with his/her arms to the seat of the chair and returns to the original position.

VII. **Management Suggestions**

1. Give each student a number.
2. Classify each student by age and sex.
3. Pick a group leader for each category.
4. Put tables for age group on blackboard.

VIII. **Procedure**

1. Have each student do as many "chair push-ups" as possible (continuous movement, no resting between push-ups).
2. Have students record the number of push-ups completed on student worksheet page 21.
3. Give findings to group leader.
4. The leader will record the score on the blackboard under the right category.
5. Students will have worksheets identical to tables on the board.
6. Students should find the average for their age and group.

X. **Discussion**

1. How does the average of each group compare to the other averages in your class?
2. Does age make a difference in the amount of push-ups one can do?
3. How do you compare to the state norms? (student worksheet page 22)

XI. **Extension**

Have the classroom make a chart for their own norms. See student worksheets pages 22 and 23.

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'YA GOTTA' HAVE HEART!

I. **Topic Area**

Heart Structure

II. **Introductory Statement**

All students will be able to demonstrate their knowledge of the heart structures by creating a heart model (exterior and interior).

Grabber Number One — Tennis ball squeeze

1. Try to do a heart's work with your hand.
2. Test the ease with which you can squeeze and get a grasp on the power of this mighty muscle. The force needed to squeeze a tennis ball is similar to the force needed to squeeze blood out of the heart.
3. Give it a good squeeze. If you squeeze seventy times a minute (the normal pulse), you will get a first-hand idea of how hard your heart works.

Grabber Number Two — Create your own stethoscope

1. Cut the top off of a plastic bottle.
2. Place a rubber tubing (obtained at any pet store or hardware store) on the top of your bottle top. Presto — stethoscope (see student worksheet page 25).

III. **Science Processes**

a. Observing
b. Predicting and estimating

IV. **Materials**

Pink clay
Blue clay
Balance
Diagram of the heart (student worksheet page 24)
Student worksheet page 25

V. **Key Question**

"What does the human heart look like?"

VII. **Management Suggestions**

Weigh out each lump of clay to each group. They must return the same weight at the end of class. (This will avoid clay flying through other rooms after class is out.)

VIII. **Procedure**

Divide the class into groups of two. One half of the groups will create the exterior of the heart. The other group will create the interior of the heart. Utilize blue and red clay in appropriate places. Refer to standard reference volumes for pictures of the heart.

X. **Discussion**

Why is one-half of the inside of the heart blue? (Lack of oxygen)

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HOW DOES YOUR HEART RATE?

I. **Topic Area**

Pulse Rate

II. **Introductory Statement**

Students will gather information concerning their pulse rates.

III. **Math Skills**

a. Measuring
b. Estimating
c. Averaging
d. Graphing
e. Charting

Science Processes

a. Record keeping
b. Interpreting data
c. Observing

IV. **Materials**

Stop watch
Graph paper
Student worksheets, pages 26-33
Pencils

V. **Key Question**

"What is the effect of exercise on your pulse rate?"

VI. **Background Information**

The pulse is a measure of heartbeat. Each throb of the pulse represents one beat of the heart. The heart pumps blood through your circulatory system of arteries, capillaries, and veins. The total number of throbs in exactly one minute (60 seconds) is the pulse rate.

VII. **Management Suggestions**

This activity can be done in pairs, with one student recording and the other student taking his own pulse count. It can also be done on an individual basis at the teacher's discretion.

VIII. **Procedure**

Part One

1. Students may work singly or in pairs. Designate one as a recorder and one as the participant. The students may reverse roles and do the activity again (optional).
2. Give each student a copy of the worksheet. Have them sit quietly for at least three minutes while you pass out the worksheets.
3. Have the students count their pulse for ten seconds as their partner watches the clock. The teacher can use a stop watch if there is not a second hand on the clock. Use fingers rather than thumb for counting.
4. Have the students compute the pulse rate for one minute (see table 1).

Part Two

1. Have the students exercise for about one minute without stopping; running in place, deep knee bends, jumping up and down on one foot, walking in place, running in place, jumping jacks, or chair steps.
2. Have the students sit down immediately and count their pulse each minute for ten minutes as their partner keeps them informed of time. The recorder will complete table 2 on the student worksheet.
3. Have the students complete the graph and plot the points that represent their pulse rate for each minute after the exercise (see worksheet page 30).

X. **Discussion**

1. What are the effects of exercise on your pulse rate?
2. How many minutes passed before your pulse rate returned to your average pulse rate on table 2?
3. Why did your pulse rate increase when you exercised?

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The Pressure's On

I. **Topic Area**

How Exercise Affects Blood Pressure

II. **Introductory Statement**

The learner will analyze the information gathered from the sample population to determine if activity in moderate amounts affects the blood pressure.

III. **Math Skills**

a. Graphing
b. Charting
c. Computing percent
d. Averaging

Science Processes

a. Measuring
b. Record keeping
c. Interpreting data
d. Observing
e. Controlling variables

IV. **Materials**

One chart per student
A large chart for the class or an overhead
Two blood pressure kits (sphygmanometer and stethoscope)
400 m measured course—track, playgound, etc.
Three colored markers and pencils
Student worksheets, pages 34-36

V. **Key Question**

"How does exercise affect blood pressure?"

VI. **Background Information**

The pressure from the arterial vessels is modified by two factors: the force of the heart and the change in size of the smaller vessels, the arterioles. Influences lessening the force of cardiac systole decrease the pressure, other things being equal. Hence, the pressure is less in sitting than in standing, less in lying than in standing, less in sleeping than in conscious states. Weakness of the heart muscle is reflected in a rise in pressure which during severe activity may reach 200 mm Hg. The distolic does not rise proportionally high, but it, too, rises.

VII. **Management Suggestions**

1. The time allotment is one period.
2. Randomly select ten students to participate in exercise in an experimental group.

VIII. **Procedure**

1. The students in both the control and experimental groups will have their blood pressure taken twice, once before and once after exercise.
2. The experimental group (10) will jog a 400 m lap, two students at a time. Record blood pressure as they come back.
3. The control group (20) will sit in the classroom and take and record blood pressure thirty minutes from activity.
4. Record information on the chart.

X. **Discussion**

1. Could you feel a physical change as you ran the lap?
2. Can you relate some of the physical changes to the increase in blood pressure? (flushed, heat, throbbing)
3. Is there a relationship between exercise and blood pressure? (Yes, there is even a variation between sitting, lying, standing, etc.)

XI. **Extension**

1. Have students lie down and have pressure taken, then standing, and then sitting.
2. Compare individual and group responses.
3. Average and graph for group, individual compared to group, etc.
4. Do the same for pulse rate, temperature, and respiration rate.

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Step In Time

I. **Topic Area**

Pulse Rate

II. **Introductory Statement**

Students will gather information concerning their resting, sitting, standing, walking and running pulse rates. They will measure the time it takes their heart rate to return to the resting rate after engaging in physical activities.

III. **Math Skills**

a. Graphing
b. Averaging
c. Measuring
d. Charting

Science Processes

a. Observing
b. Measuring
c. Interpreting data

IV. **Materials**

Chair
Stop watch
Graph paper
Student worksheets, pages 37-38

V. **Key Question**

"How fast does your heart return to its resting rate after exercise?"

VIII. **Procedure**

1. Have students lie flat for two minutes, then check pulse rate, using fingers rather than thumb, and record data.
2. Have students sit quietly in a chair for two minutes, then check pulse rate and record data (resting data).
3. Have students sit in a chair for two minutes, then stand and check pulse rate, sit down and continue checking until pulse rate returns to normal. Record time and data.
4. Students walk in place for two minutes and record pulse rate. Sit down and check pulse rate until it returns to normal sitting rate. Then record time.
5. Students run in place for one minute. Record pulse rate and time required to return to normal sitting rate.
6. Run/sprint 50 yards. Record pulse rate and time needed to return to normal sitting pulse rate.
7. Chart each activity against resting data and develop composite graph of all information.

XI. **Extension**

1. Check dancers, swimmers, football players and basketball players to see which group has the shortest recovery period.
2. What was the lowest pulse rate recorded?
3. Do boys have a lower pulse rate than girls?
4. Does age of test group have any significance?
5. Who had the shortest recovery time? The longest? Why?
6. Students should run each phase of this experiment at least three times and record. They should also find the average for each experiment.

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Temperature's Rising!

I. **Topic Area**

How Exercise Affects Body Temperature

II. **Introductory Statement**

The learner will analyze the information gathered from a sample population to determine whether or not activity changes the body temperature.

III. **Math Skills**

a. Practicing
b. Computing percent
c. Charting
d. Graphing
e. Measuring

Science Processes

a. Observing
b. Classifying
c. Measuring
d. Predicting and estimating
e. Controlling variables and data
f. Recording data
g. Analyzing and generalizing

IV. **Materials**

One large class chart
400 m measured course
Three colored markers and pencils
Five thermometers—Celsius
Isoprophyl (rubbing) alcohol
Cup
Student worksheets, pages 39-40

V. **Key Question**

"Does the heat you feel after exercise indicate a rise in true body temerature?"

VII. **Management Suggestions**

1. Sterilize thermometers in isoprophyl alcohol.
2. Students should be divided into three groups of five students:
   Experimental group 1
   Experimental group 2
   Control group

VIII. **Procedure**

1. Group students (five per group).
2. Take temperature of each student in each group, record on student data sheet.
3. Have the control group sit.
4. Have experimental group 1 walk a 400 m lap.
5. Have experimental group 2 run a 400 m lap.
6. Record temperatures at the end of activity.
   a. First, runners
   b. Second, walkers
   c. Third, sitters
7. Record and graph on student chart.
8. Construct class data sheet, average, etc.

X. **Discussion**

1. What effect did exercise have on the body temperature overall?
2. Can you identify variations in body temperature?
3. Analyze and discuss class average vs. individual temperatures.

XI. **Extension**

1. Students can take their temperatures at given times during the day and night.
2. Prepare a temperature cycle per student.
3. Graph individual averages and compare to average 98.6°. Chart variations.

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AM I YOUR TYPE?

I. **Topic Area**

Blood Typing

II. **Introductory Statement**

In studying the human body processes, one of the basic and most essential is the circulatory system. One of the most important aspects of this system is finding out what your blood type is.

III. **Math Skills**

a. Charting
b. Using ratio/proportion
c. Figuring differences

Science Processes

a. Observing
b. Classifying
c. Predicting
d. Estimating

IV. **Materials**

Alcohol pad or cotton ball
Lancet
Toothpicks (two)
Anti-A and Anti-B Glutens
Hemo-Pad
Paper towel—about 12" x 18"
Student worksheets, pages 41-43

V. **Key Question**

"What is my blood type? Why do we have to know what our blood type is?"

VI. **Background Information**

1. Blood typing kits are available but must be ordered at least six weeks prior to testing.
2. Kits and materials that aren't used can be kept and used the following year without any apparent loss in accuracy of results.
3. Keep ammonia inhalents handy.
4. Allow plenty of ventilation flow and low heat. (Alcohol reminds students of doctor's offices.)
5. Have students pick up all materials prior to testing. DO NOT ALLOW STUDENTS TO MOVE AROUND IMMEDIATELY AFTER TESTS: FIVE TO TEN MINUTES IN-SEAT TIME RECOMMENDED.
6. Explain and demonstrate procedures thoroughly prior to testing. (One day seems to work.)
7. DO NOT minimize amount of pain. Let students know there will be some; however, it is nothing they haven't experienced before. This cuts down on students overreacting on testing day.
8. Permission sheets sent home and returned by testing day.

VII. **Management Suggestions**

1. Lay out materials before activity. Have students make a materials list before testing.
2. Have a sequential arrangement of materials as they will be needed.
3. To save you time, have two non-participants administer anti-glutens as students need them. This frees the teacher for observation.
4. Prior to test, go over all possible results pictorially that students could have occur. (You will still have to confirm results.)
5. All procedures should be gone over prior to testing, including the materials needed: hygiene, actual testing, reading of results, clean up, follow up, etc.

VIII. **Procedure**

1. Lay out materials on paper toweling.
2. Tear wrapper from handle end of lancet—do not expose tip to air.
3. Remove wrapper from alcohol pad.
4. Sterilize tip of index finger with alcohol pad, allow to air dry.
5. Apply force with your thumb to base of first joint of index finger. Place pad of middle finger on cuticle of index finger. Press.
6. Taking lancet between index finger and thumb of your working hand, line up tip with pad of index finger. With a short, forceful jab poke one hole in index finger tip.
7. Blot first drop of blood on alcohol pad. Place lancet on paper towel for later disposal. Using thumb, squeeze one drop of blood from fingertip—place drop in Circle A. Place a second drop in Circle B. Raise hand to receive anti-glutens. Place alcohol pad on puncture and hold in place with your thumb.
8. After receiving Anti A-Anti B solutions, stir Anti A circle thoroughly with side of toothpick. Be sure to spread mixture out to fill entire circle. Discard toothpick onto paper towel. Get second toothpick and repeat operation for Anti B circle. Discard toothpick onto paper towel.
9. Pick up hemo-card and gently rock for about one to two minutes. Set card down, watch results.
10. Record blood type.
    (1) If after stirring, rocking, etc., A and B remain the same—you have blood Type O.
    (2) If A circle shows clotting and circle B does not—you are Type A.
    (3) If circle B clots and A remains unchanged—you have Type B blood.
    (4) If both circle A and B clot—you have type AB blood.

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Take A Breather!

PERSONAL LUNG CAPACITY

I. **Topic Area**

Lung Capacity

II. **Introductory Statement**

This activity allows children to become aware of factors that affect lung capacity.

III. **Math Skills**

a. Averaging
b. Charting
c. Solving for an unknown

Science Processes

a. Controlling data and variables
b. Applying
c. Generalizing

IV. **Materials**

Centimeter tapes (one per two students)
Common nine-inch balloons (one package of twelve per two students)
Student worksheets, pages 44-48

V. **Key Question**

"What are some factors that affect lung capacity?"

VI. **Technical Information**

1. Lung capacity is measured by determining the volume of air the lungs can hold. Therefore, instead of referring to these as "capacity" measurements, we call them "volume" measurements.
2. The circumference measurement is not a measurements of volume; however, it does give an indication of volume.
3. Definitions:
   Tidal air volume—amount of breath lungs contain during normal breathing (not measurable by balloon test, so not included during testing)
   Reserve air volume—amount of breath that can be forced out of lungs after normal exhalation
   Vital air volume—maximum amount of air that lungs can hold

VII. **Management Suggestions**

1. Allow one week for total activity by following the suggested schedule in Procedure, part VIII.
2. Students should work in pairs with one as interviewer and one as recorder.

VIII. **Procedure**

Day One (approximately one hour)

1. Suggestions for pre-activity discussion:
   a. Does everyone breathe exactly alike? (Define inhale and exhale.)
   b. Count how many times you inhale normally in one minute. Compare with others.
   c. Describe what happens when you inhale. Describe what happens when you exhale.
   d. What happens when you try to take in more air after inhaling normally? (Your lungs fill to full capacity and your chest expands.)
   e. Is it possible to exhale more air than you inhale? Why? (Yes, because there's air left in your lungs after normally exhaling.)
   f. Discuss and define tidal, reserve, and vital air volume. (See Technical information. ***Warning:*** A lot of explanation and demonstration is involved in defining reserve air volume. Explain that reserve air is that which is left in the lungs after *normal* exhalation. Many students will unwittingly take a short breath before forcing out all their air.)
   g. Do you know anyone who might have trouble doing some of these breathing exercises? Why? (Write students' answers on board. Factors that students might suggest are age, sex, exercise habits, weight and smoking habits. If students don't suggest these, direct discussion toward recognizing them as factors.)
   h. Restate Key Question: "What are some factors that affect lung capacity?"
2. Hand out a student interview sheet (student worksheet page 45) on which each student will do a practice interview.
3. Perform the following procedure on a selected student. All other students observe and record the results. (Note: Do each step in the procedure as precisely as possible, since this is what the students will have to do on their own.)
   a. Record the selected student's response to the interview questions at top of interview sheet.
   b. Perform lung capacity test. (Note: Make sure you inflate balloon twice before taking measurement so balloon's resistance is lessened.)
   c. Lung Capacity Tests:
      Reserve air test—Student exhales reserve air into balloon. Pinch balloon's nozzle. With cm tape, measure circumference of inflated balloon at widest point. Record on sheet for Trial #1. Repeat twice more for reserve air volume.
      Vital air test—Do same procedure three times, determining vital air volume. Record these results.
   d. Compute averages on each sheet.
4. Choose student pairs.
5. Give each pair two balloons, one cm tape and two interview sheets so they may practice on each other. Give assistance where needed.
6. Discuss any problems.

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Days Two and Three

Assign the above tasks to be performed on a varied group of at least four people outside of class. (Stress the importance of selecting four very different people to interview. Example—a large person, a smoker, an old person and a young person.)

Days Four and Five (approximately one hour each day)

1. Have students average the results on each sheet.
2. Hand out Master Data Sheet (student worksheet page 46) to each student pair. Have them tally in the appropriate color code the averages for each interview sheet.
3. Compile results from all Master Data Sheets on a similar Class Data Sheet (tagboard, overhead or chalkboard).
4. (For seventh or eighth grade or advanced elementary.) Using student worksheet, compute the actual volume from the circumference figure.

IX. **Discussion**

1. Interpret the charts to arrive at as many conclusions as possible.
2. Which factors affect a person's lung capacity? (non-smoking, exercising, etc.)
3. What factors benefit lung capacity? Compare them. (Exercise may be more important than non-smoking.)
4. What factors are detrimental to lung capacity? Compare. (Smoking, old age; smoking may be more detrimental, in most cases.)
5. Which type of lung capacity is most affected by each factor? (See results of Master Data Sheet.)

XI. **Extension**

1. Explain how lung capacity is related to our daily living habits. (exercise, smoking, etc.)
2. As we grow older, how can we keep our lung capacity at its maximum? (By developing good living habits that are beneficial to lung capacity.)

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You Take My Breath Away

I. **Topic Area**

Respiration

II. **Introductory Statement**

All the activities of a living organism require energy. Human activities such as walking, running, breathing and even sleeping require different amounts of energy. Some, such as sleeping, require very little energy, while others, such as running, require much energy. Those activities requiring a great deal of energy are called *Strenuous Activities*. In this investigation you are going to use normal respiratory rates as a method to determine which of two activities is more strenuous.

III. **Math Skills**

a. Counting
b. Averaging
c. Measuring time
d. Graphing
e. Estimating

Science Processes

a. Observing
b. Hypothesizing
c. Recording data
d. Interpreting data
e. Generalizing

IV. **Materials**

A bicycle and a chair
A clock or stopwatch
Student worksheets, pages 49-50

V. **Key Question**

"Which form of exercise is more strenuous, riding a bicycle or jogging?"

Grabber—Use Lycopodium and an alcohol burner to create a flash, and relate to oxygen utilization in the breathing process and respiration in the cell.

1. Place match to Lycopodium flour (it won't burn) and say: "Please note the lack of reaction by the Lycopodium to the heat source."
2. Toss Lycopodium onto an alcohol burner (this will result in a flash explosion). Use a small amount—1 teaspoon maximum. Say: "Please note
   a. "The Lycopodium is the same
   b. "The flame source is the same
   c. "What factor is different?"
3. Answer:
   a. The oxygen supply—it combines more effectively with the Lycopodium.

VIII. **Procedure**

1. Determine your normal respiratory rate:
   a. Count how many times you breathe in one minute
   b. Repeat two more times (total of 3).
   c. Find your average normal respiratory rate.
2. Ride a bicycle for 5 minutes without stopping
3. Stop riding and immediately determine your respiratory rate. (You will need to have a partner to help you count)
4. Record this data on a data table.
5. Sit down and rest until your respiratory rate returns to normal and stays normal for at least 3 minutes.
6. Now go jogging for 5 minutes without stopping.
7. Stop jogging and immediately determine your respiratory rate.
8. Record this data on your data table.
9. Using your data table and your average normal respiratory rate, make a bar graph that shows which activity is more strenuous.

IX. **Discussion**

1. What are some of the variables that could affect respiration rates? (physical condition, age, sex, smoking, etc.)
2. What would be another way to measure and compare the strenuous nature of an activity? (heart rate)
3. Predict which would be more strenuous, swimming for 5 minutes or roller skating for 5 minutes? *Why?*
4. How could we measure and compare the efficiency of bicycle riding and jogging? (distance divided by respiratory rate)

XI. **Extension**

1. Use a chair stepping exercise indoors as a substitute for the bicycle.
2. Compare the respiratory rate activities done before lunch; and the same activities done after lunch.

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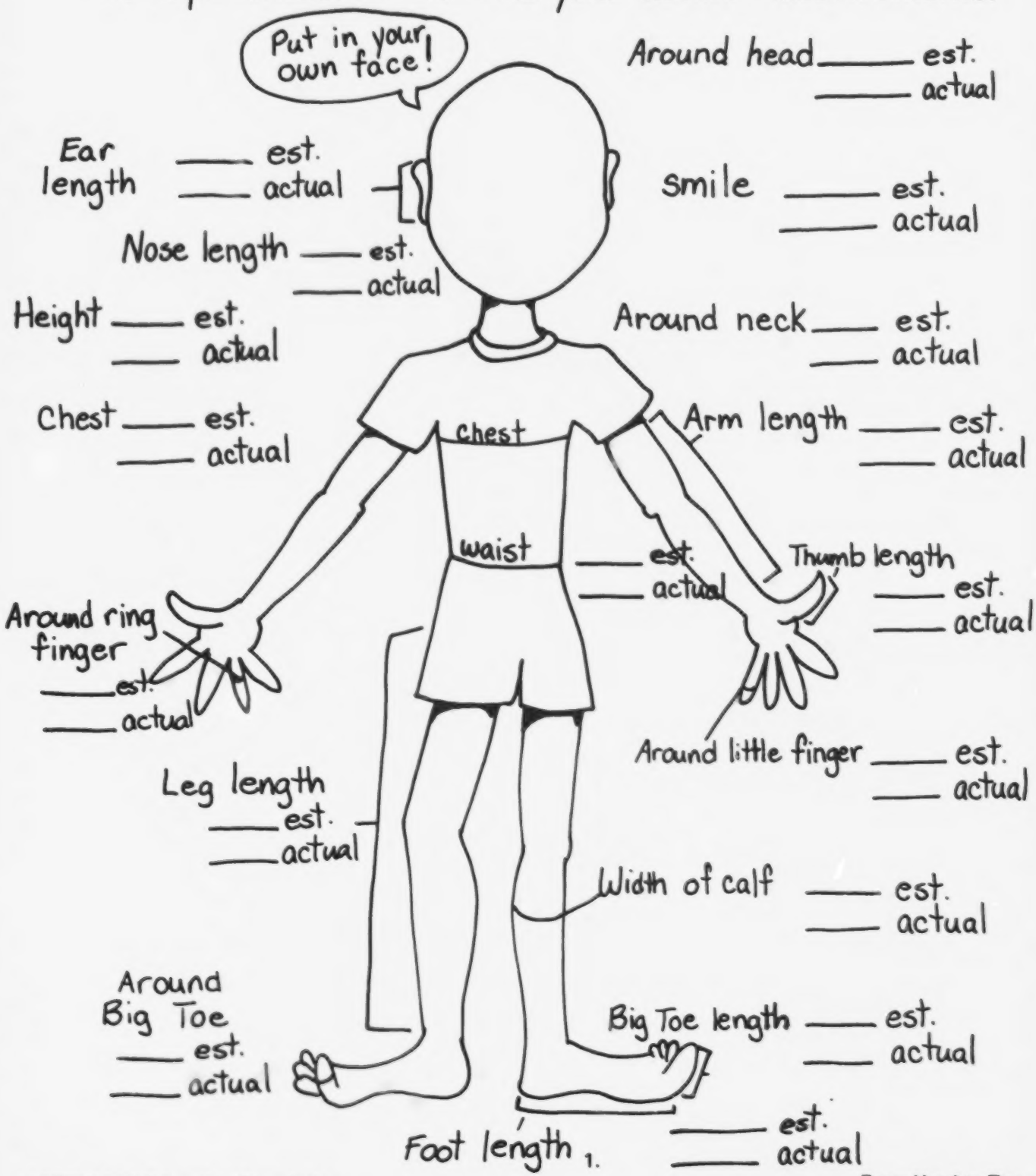
How Do You Measure Up?

"Estimate your measurements in metrics, then use a tape measure to find your actual measurements."



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METRIC MASTER

height _____

elbow to middle finger _____

knee to floor _____

leg length _____

circumference of neck _____

circumference of chest _____

palm _____

foot width _____

circumference of big toe _____

circumference of head _____

circumference of wrist _____

circumference of arm _____

nose to fingertip _____

foot length _____

circumference of ankle _____

regular step _____

large step _____

gigantic step _____

handspan _____

thumb _____

pinkie _____

middle finger _____

index finger _____

weight _____

shoe width _____

shoe length _____

shoe weight _____

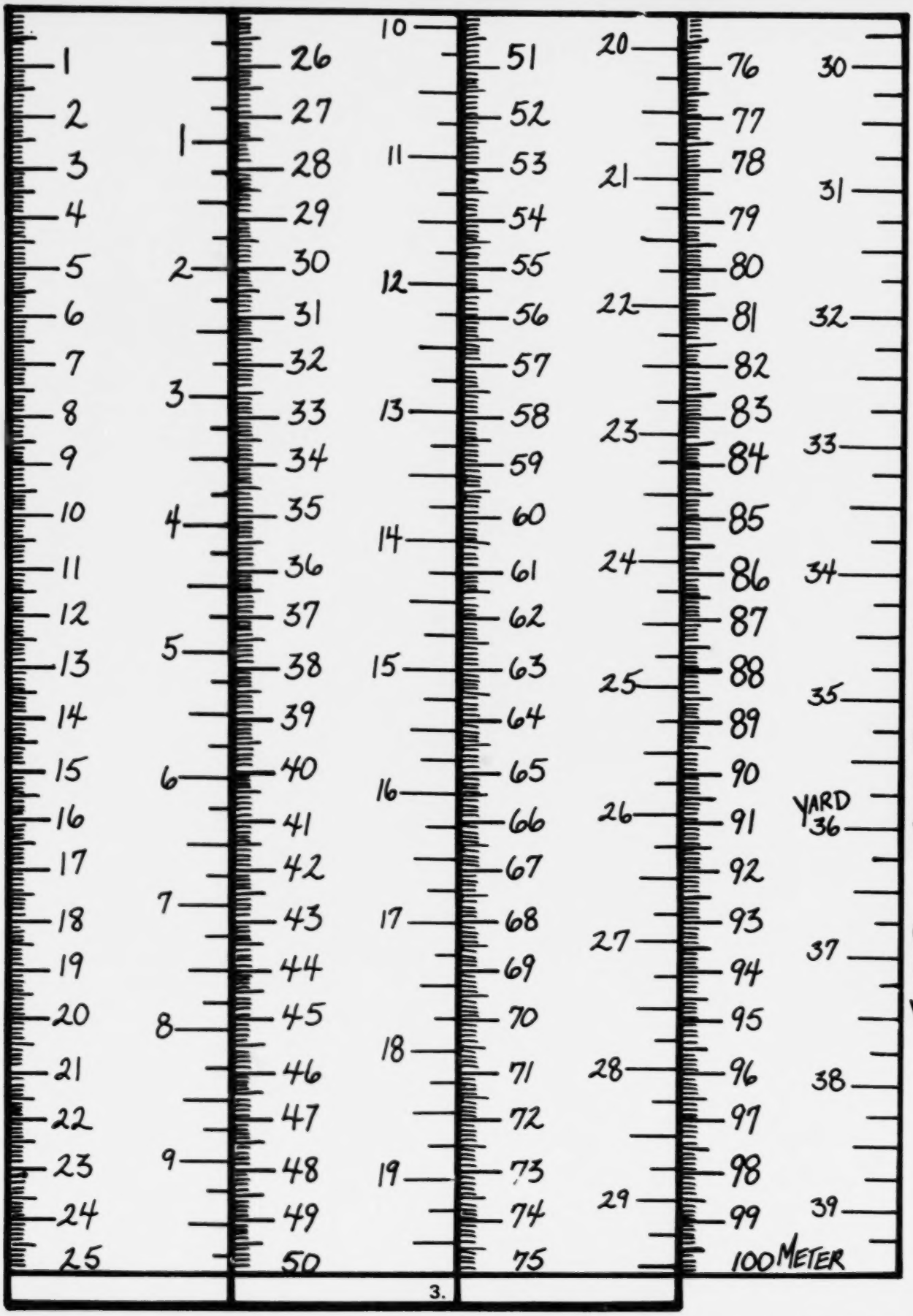
circumference of calf _____

circumference of ankle _____

waist _____

_____ Signed _____ Date _____ Age

I promise that all the above measurements are accurate to the best of my ability.



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What is the Average Student Like?

Mark Boy or Girl. Give your Best answers!

1. B G Age	18. B G Favorite TV Show
2. B G Height	19. B G Hours per day spent watching T.V.
3. B G Weight	20. B G All-time Favorite Movie
4. B G Eye Color	21. B G Jean Brand
6. B G Hair Color	22. B G Shoe Size
6. B G Hair type curly straight wavy	23. B G Best Video Game
7. B G Hair length long medium short	24. B G How do you get to school?
8. B G Freckles yes no	26. B G Shoe Brand
9. B G Glasses yes no	26. B G Hobby
10. B G Favorite Subject	27. B G Holiday
11. B G Most Disliked Subject	28. B G Favorite Actor
12. B G Favorite Color	29. B G Favorite Actress
13. B G Food	30. B G Future Occupation
14. B G Lucky Number	31. B G Pet
15. B G Gum Flavor	32. B G Brand of Shampoo
16. B G Candy Bar	33. B G Horoscope
17. B G Sport	34. B G Favorite Song

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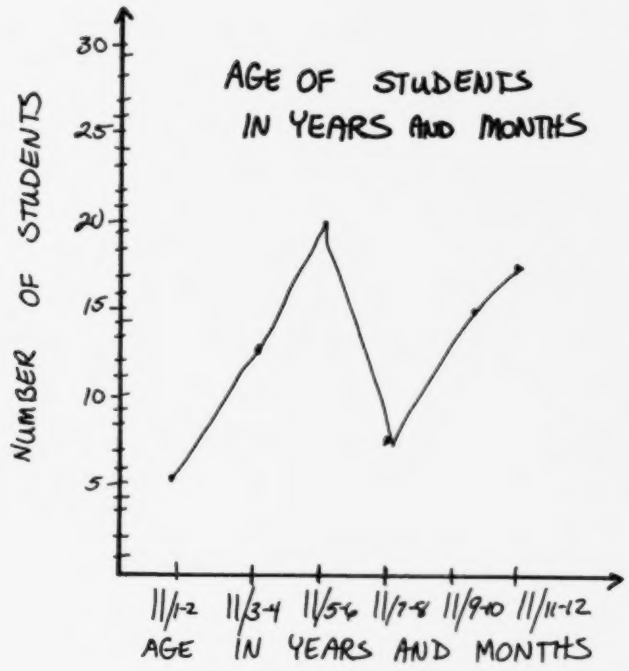
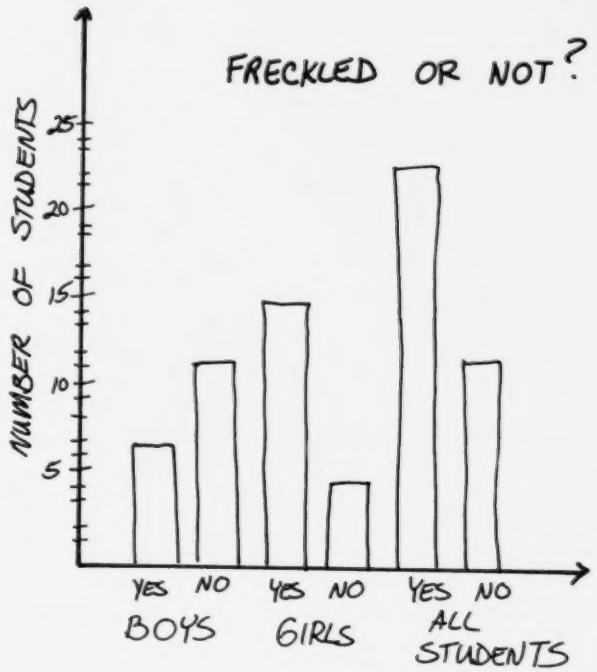
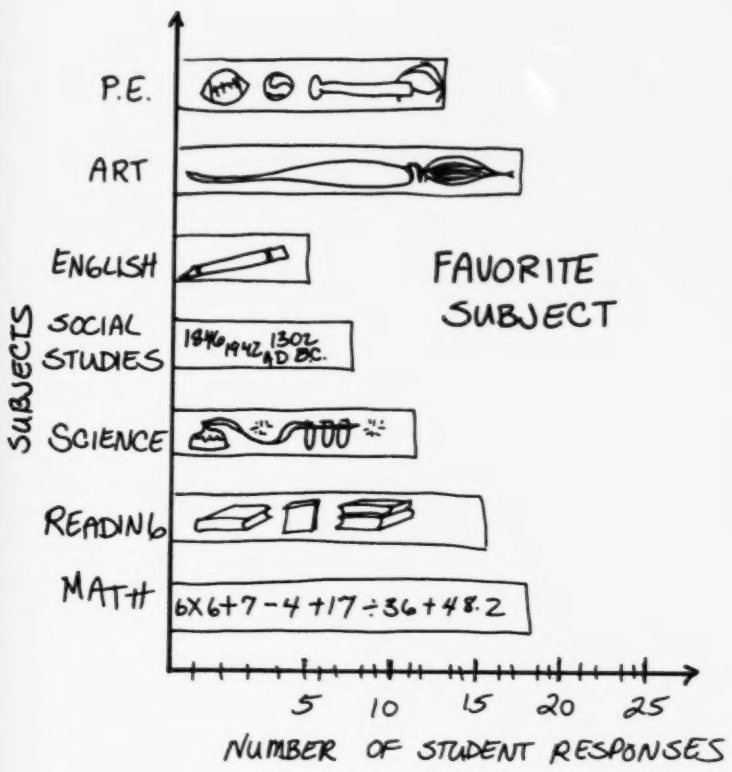
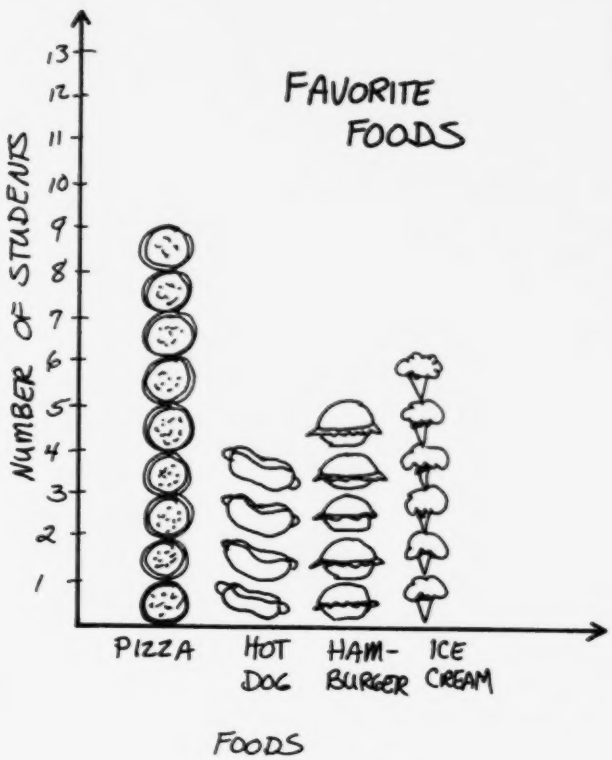
SAMPLE GRAPHS





Be Creative!





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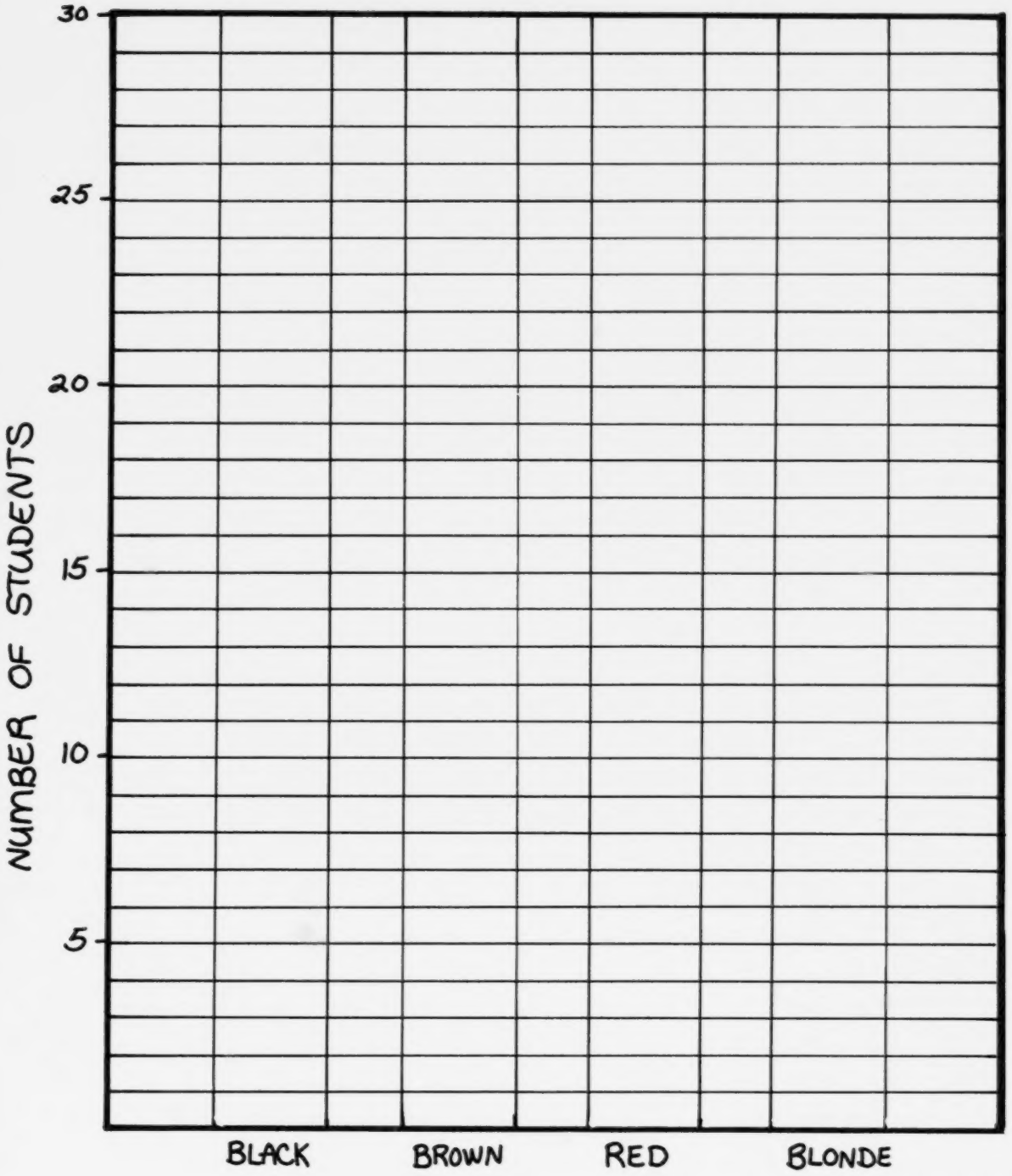
AVERAGE STUDENT

_____NAME

COLOR of HAIR



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How Average Are You?

Name _____

Last First Middle Initial

	Pre		Post	
Weight	_____ Kilograms	_____ pounds	_____ Kilograms	_____ pounds
Height	_____ cm	_____ inches	_____ cm	_____ inches

EYE COLOR _____

HAIR COLOR _____

7.

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AVERAGE STUDENT

_____ NAME

ARE YOU MEAN?

ESTIMATE YOUR MEASUREMENT IN CM, THEN MEASURE TO FIND YOUR ACTUAL MEASUREMENTS. RECORD AND FIND THE DIFFERENCE.

MEASURE:	ESTIMATE	ACTUAL MEASUREMENT	DIFFERENCE + or −
1. EAR LENGTH			
2. NOSE LENGTH			
3. AROUND NECK			
4. SMILE			
5. AROUND HEAD			
6. HEIGHT			
7. CHEST			
8. LEG LENGTH			
9. FOOT LENGTH			
10. BIG TOE LENGTH			
11. CALF WIDTH			
12. WAIST			
13. ARM LENGTH			
14. THUMB LENGTH			
15. AROUND LITTLE FINGER			
16. AROUND RING FINGER			
17. AROUND BIG TOE			

TOTAL DIFFERENCE	
÷17	
AVERAGE DIFFERENCE	

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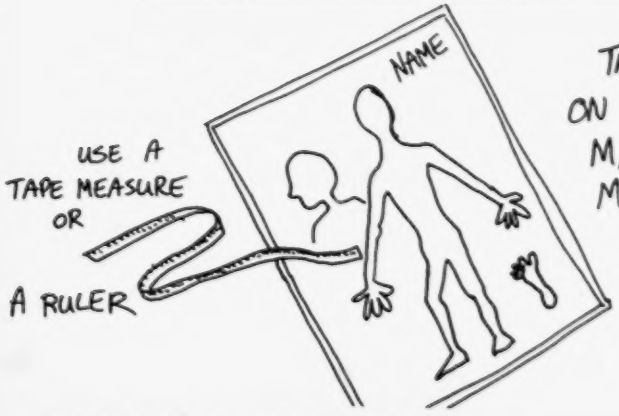
NAME _____

CORPUS All AROUND US

USE YOUR DRAWN BODY OUTLINE. MEASURE ALL LENGTHS IN CM AND RECORD YOUR MEASUREMENTS.

	CM MEASUREMENT		CM MEASUREMENT
HAND SPAN (FINGER TO THUMB)		DISTANCE FROM RIGHT EAR TO LEFT EAR	
HEEL TO TOE OF RIGHT-FOOT		SHOULDER JOINT TO HIP JOINT	
WRIST TO ELBOW		WRIST TO SHOULDER	
ELBOW TO SHOULDER		SHOULDER JOINT TO TOP OF HEAD	
BASE OF HEAD TO BASE OF SPINE		TOP OF HEAD TO CENTER OF EAR	
KNEE TO ANKLE		CENTER OF EAR TO JAW	
HIP JOINT TO ANKLE		CENTER OF EAR TO BRIDGE OF NOSE	
SHOULDER JOINT TO CLAVICLE		CENTER OF EAR TO BACK OF HEAD	
TOP OF HEAD TO POINT OF JAW		CENTER OF EAR TO SHOULDER	
HIP JOINT TO KNEE		WIDTH OF BALL OF FOOT	
FINGER LENGTHS ___ 1 ___ 2 ___ 3 ___ 4 ___ 5		TOE LENGTHS ___ 1 ___ 2 ___ 3 ___ 4 ___ 5	



TRACE YOUR BODY OUTLINE ACCURATELY ON A LARGE PIECE OF PAPER. PUT MASKING TAPE AROUND THE EDGES. MEASURE AND RECORD TO THE NEAREST CM.

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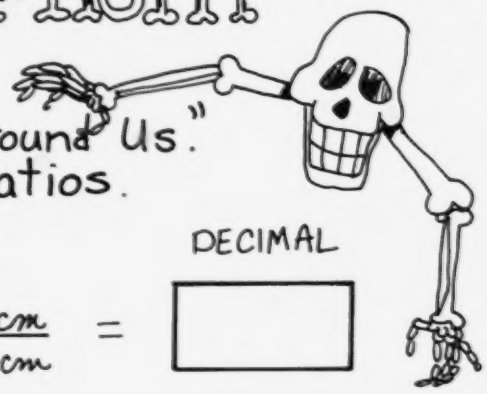
NAME _____

Golden Proportion



Use Your Data From "Corpus All Around Us."
Compare Lengths And Make Ratios.

1. $\frac{\text{ELBOW TO WRIST}}{\text{SHOULDER TO WRIST}}$ = $\frac{\text{RATIO}}{\text{\_\_\_\_ cm / cm}}$ = DECIMAL ☐

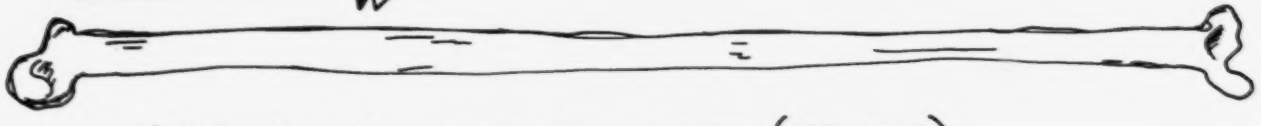
2. $\frac{\text{KNEE TO ANKLE}}{\text{HIP TO ANKLE}}$ = $\frac{\text{\_\_\_\_ cm}}{\text{cm}}$ = ☐

3. $\frac{\text{HIP TO BOTTOM OF FOOT}}{\text{TOP OF HEAD TO BOTTOM OF FOOT}}$ = $\frac{\text{\_\_\_\_ cm}}{\text{cm}}$ = ☐

DECIMAL TOTAL = ☐

DECIMAL AVERAGE = ☐

YOUR GOLDEN PROPORTION



MEASURE YOUR THIGH BONE (FEMUR) _____ cm
THEN :

BOYS (FEMUR) _____ cm X 1.88 + 81.31 cm = _____ cm

GIRLS (FEMUR) _____ cm X 1.945 + 72.84 cm = _____ cm

HOW DOES YOUR ANSWER COMPARE WITH YOUR HEIGHT?

10.

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Ye Olde Records for Dem Bones of

NAME

Skull

cm

1. NASAL TO OCCIPITAL (BACK OF HEAD) 1.____
2. TOP OF FOREHEAD TO BASE OF LOWER JAW 2.____
3. POINT OF CHIN TO BACK OF JAW 3.____
4. BACK OF JAW TO BACK OF HEAD 4.____

Shoulder Bone

5. COLLAR BONE FROM STERNUM TO SHOULDER 5.____

Shoulder Blade

6. FROM SHOULDER TO INNER EDGE 6.____
7. FROM TOP TO BOTTOM 7.____
8. FROM INNER TO OUTER EDGE AT BASE 8.____
9. WIDTH OF NARROW PORTION OF SHOULDER 9.____

Arm

10. UPPER ARM FROM BEND AT SHOULDER TO ELBOW 10.____
11. LOWER ARM FROM BEND OF ELBOW TO BEND OF WRIST 11.____

Fingers

(measure with fingers bent)

	FINGER JOINTS	cm
12. INDEX	12. 1st	____
	2nd	____
	3rd	____
13. MIDDLE	13. 1st	____
	2nd	____
	3rd	____
14. RING	14. 1st	____
	2nd	____
	3rd	____
15. LITTLE	15. 1st	____
	2nd	____
	3rd	____
16. THUMB	16. 1st	____
	2nd	____

Palm

(measure from knuckle to wrist bend)

17. INDEX 17.____
18. MIDDLE 18.____
19. RING 19.____
20. LITTLE 20.____
21. THUMB 21.____

Wrist

22. FROM BEND OF WRIST TO BEND OF PALM 22.____

Spine

23. NECK - FROM BASE OF SKULL TO SHOULDER 23.____
24. SPINE FROM SHOULDER TO BEND IN WAIST 24.____

page 1.

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Ye Olde Records for Dem Bones of _____ NAME

Pelvis

cm

25. WIDTH 25. _____

26. LENGTH FROM TOP OF HIP BONE TO BALL/SOCKET PLUS ONE HAND WIDTH 26. _____

27. SPACE FOR ILIUM/SPINE CONNECTION EQUALS 1/4 TOTAL WIDTH 27. _____

28. WIDTH OF LOWER PELVIS EQUALS 1/2 UPPER WIDTH 28. _____

29. SPACE BETWEEN LOWER FLANGE = 1/4 LOWER WIDTH 29. _____

Upper Leg

30. FROM BALL/SOCKET TO KNEE BEND 30. _____

31. BALL/SOCKET EQUALS 3/4 HAND WIDTH 31. _____

Knee Cap

32. MEASURE ACROSS IN 3 DIFFERENT AREAS 32. _____

Lower Leg

33. FROM KNEE BEND TO ANKLE BEND PLUS 2 FINGER WIDTHS 33. _____

Toes

cm

measure with toes bent

33. BIG 33. 1st _____ 2nd _____

34. SECOND 34. 1st _____ 2nd _____

35. THIRD 35. 1st _____ 2nd _____

36. FOURTH 36. 1st _____ 2nd _____

37. LITTLE 37. 1st _____ 2nd _____

Foot

(measure from bend of toes to bend of foot)

38. BIG 38. _____

39. SECOND 39. _____

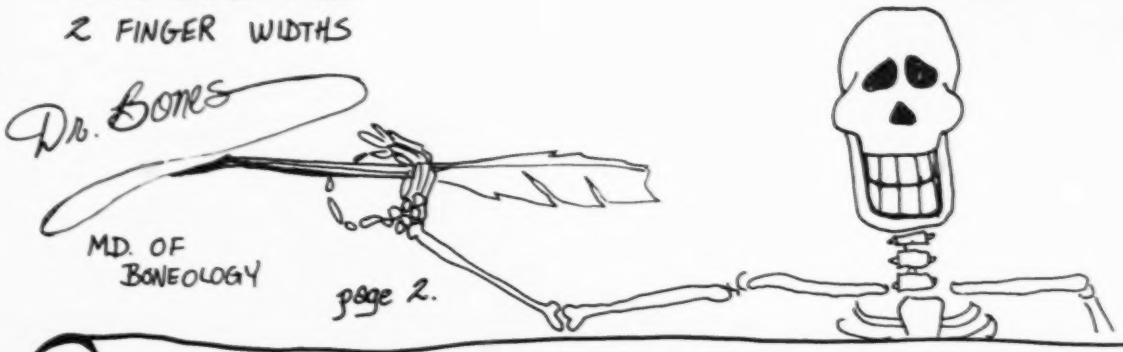
40. THIRD 40. _____

41. FOURTH 41. _____

42. LITTLE 42. _____

Ankle

43. FROM BEND OF FOOT TO APEX OF HEEL 43. _____



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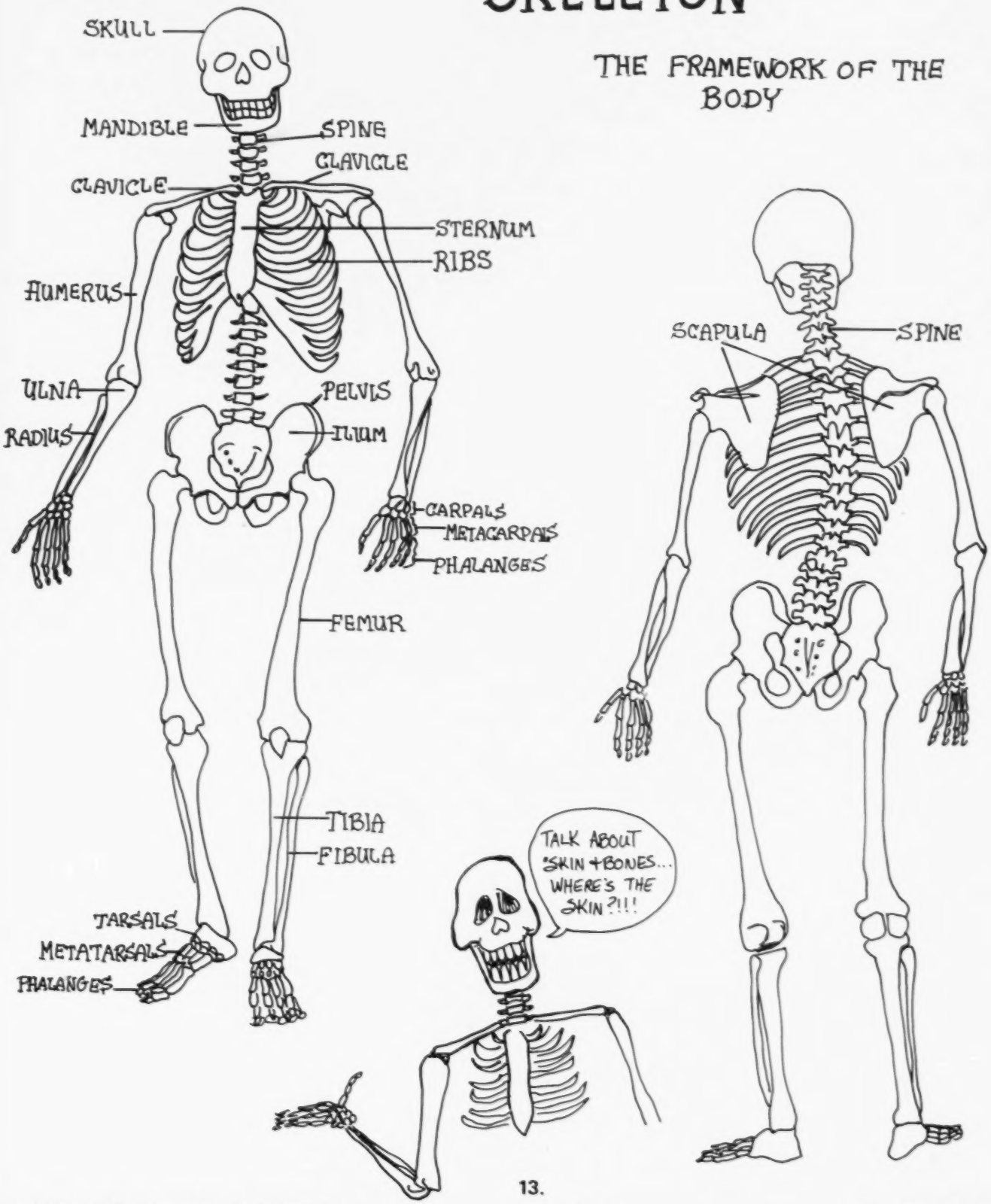
"DEM BONES"

SKELETON



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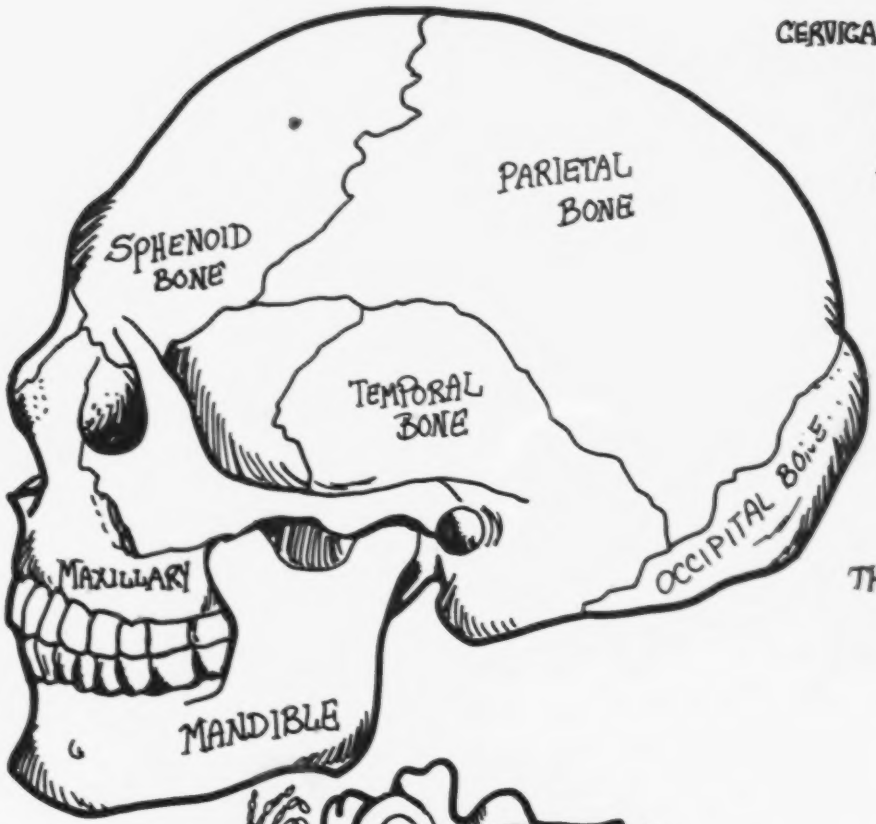
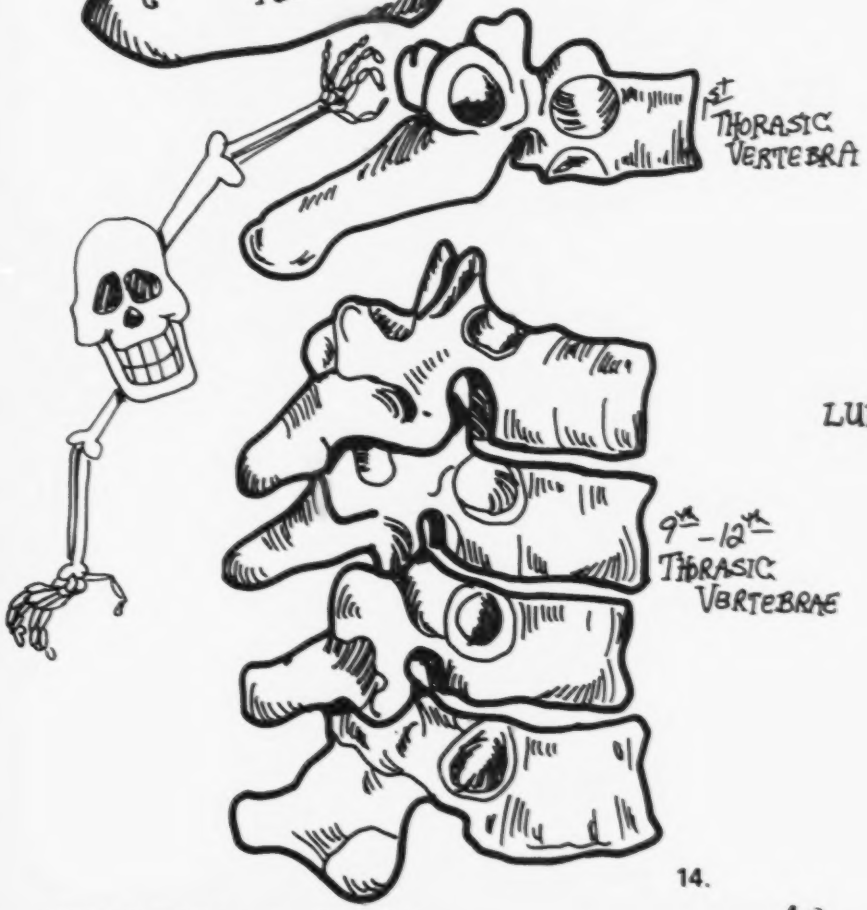
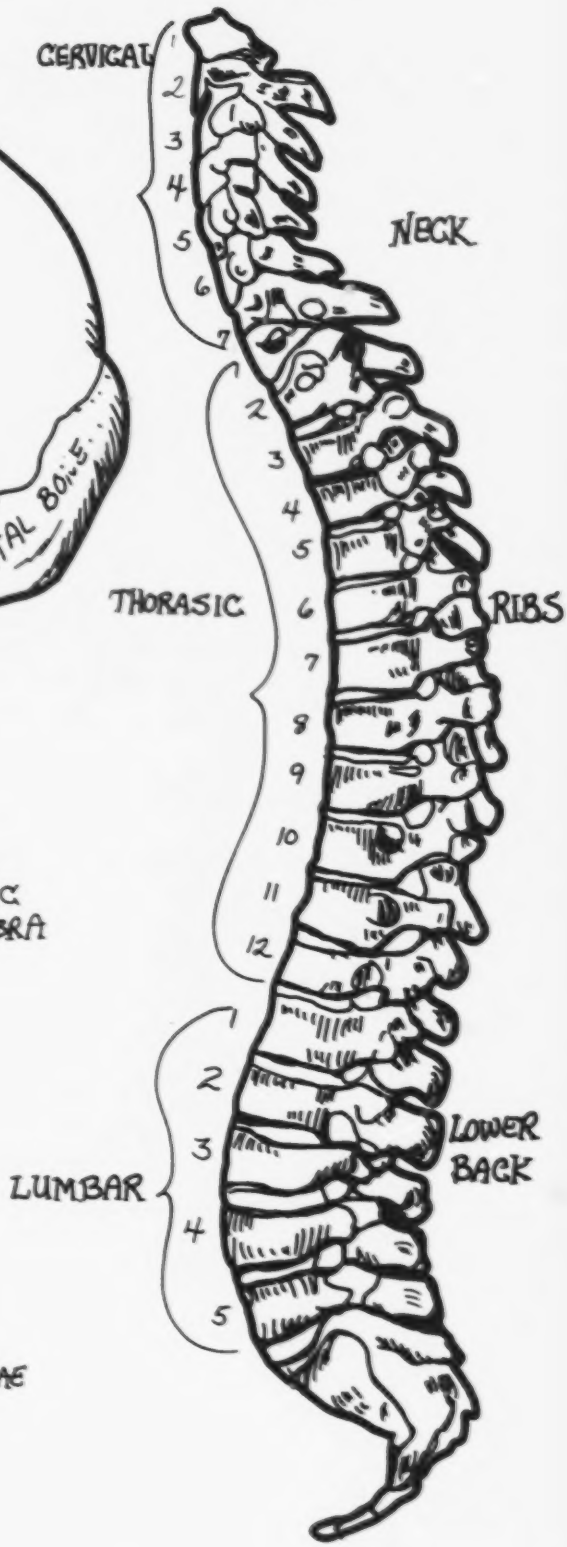
'DEM BONES'

SIDE VIEW OF SKULL





SPINE



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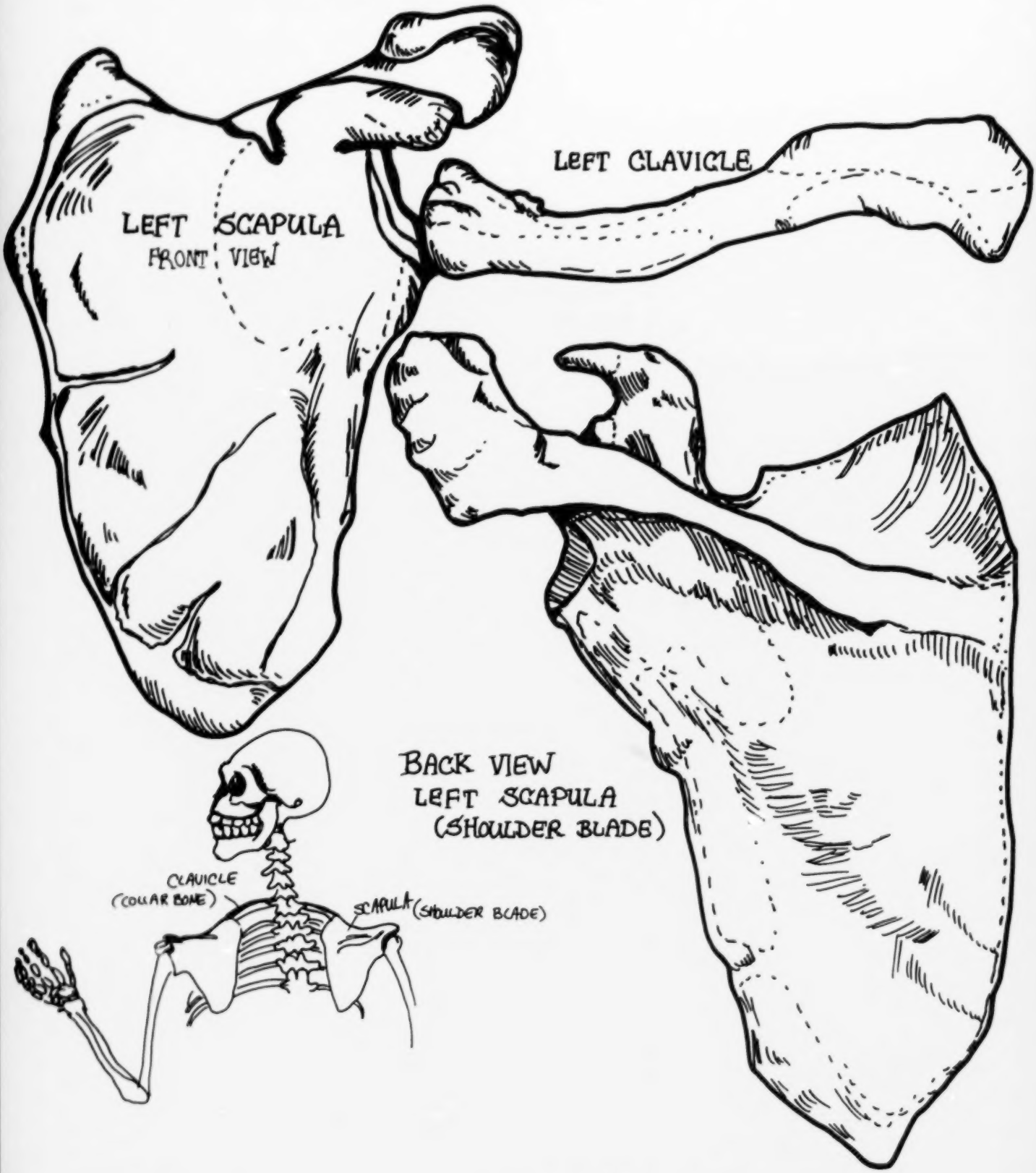
SHOULDER UNIT 'DEM BONES'



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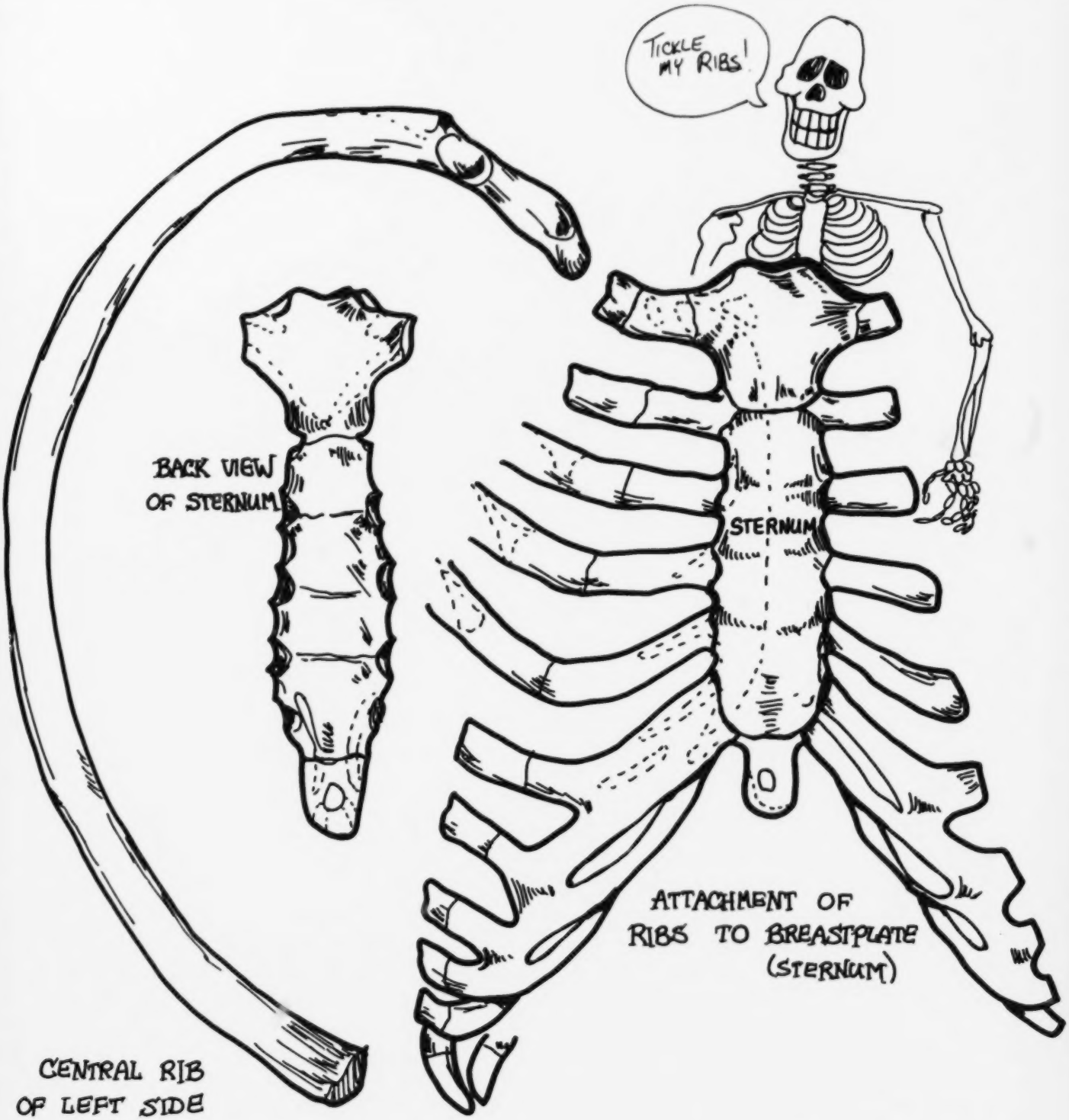
RIBS

'DEM BONES'



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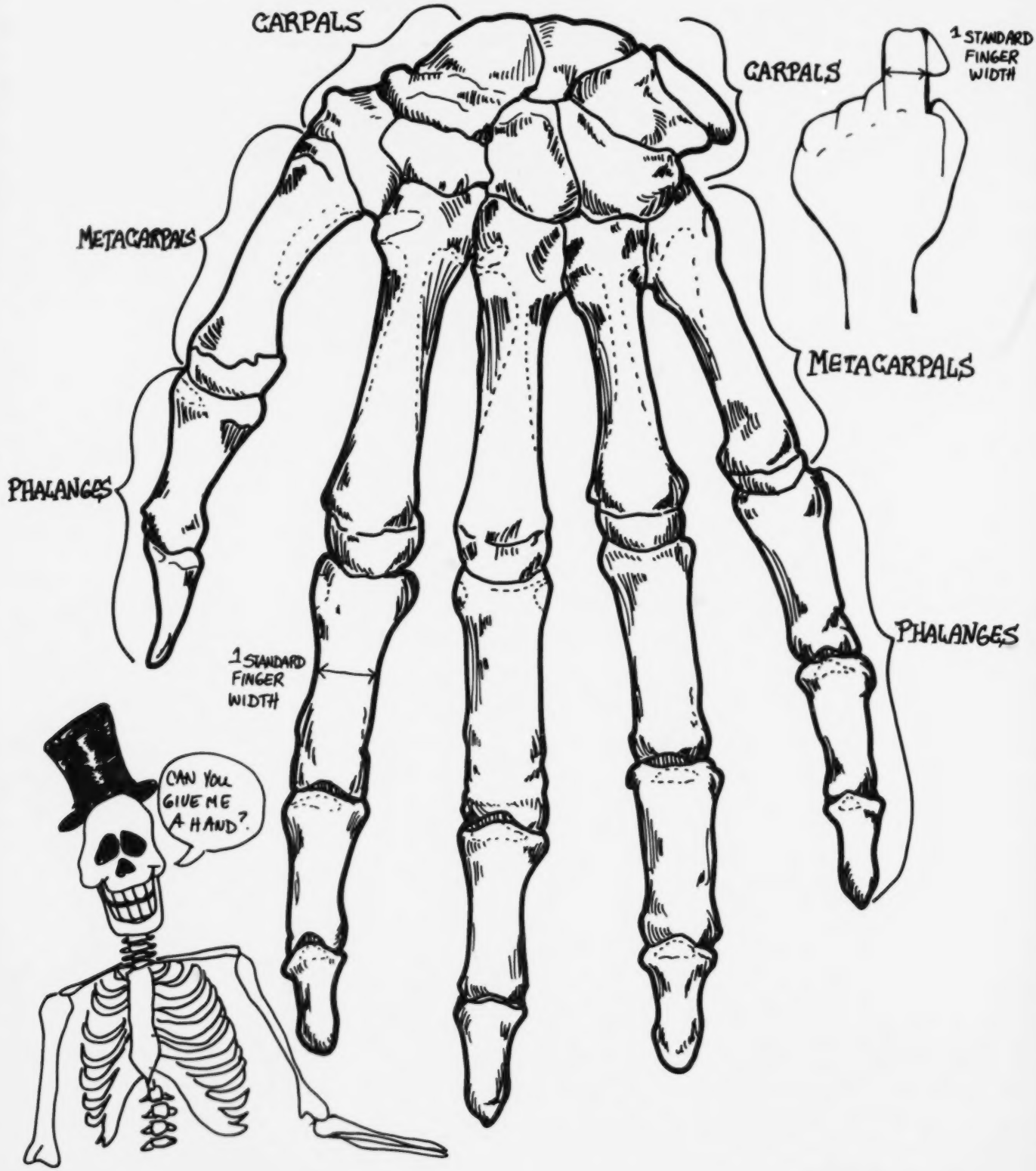
Bones Of The Left Hand
Palm Down



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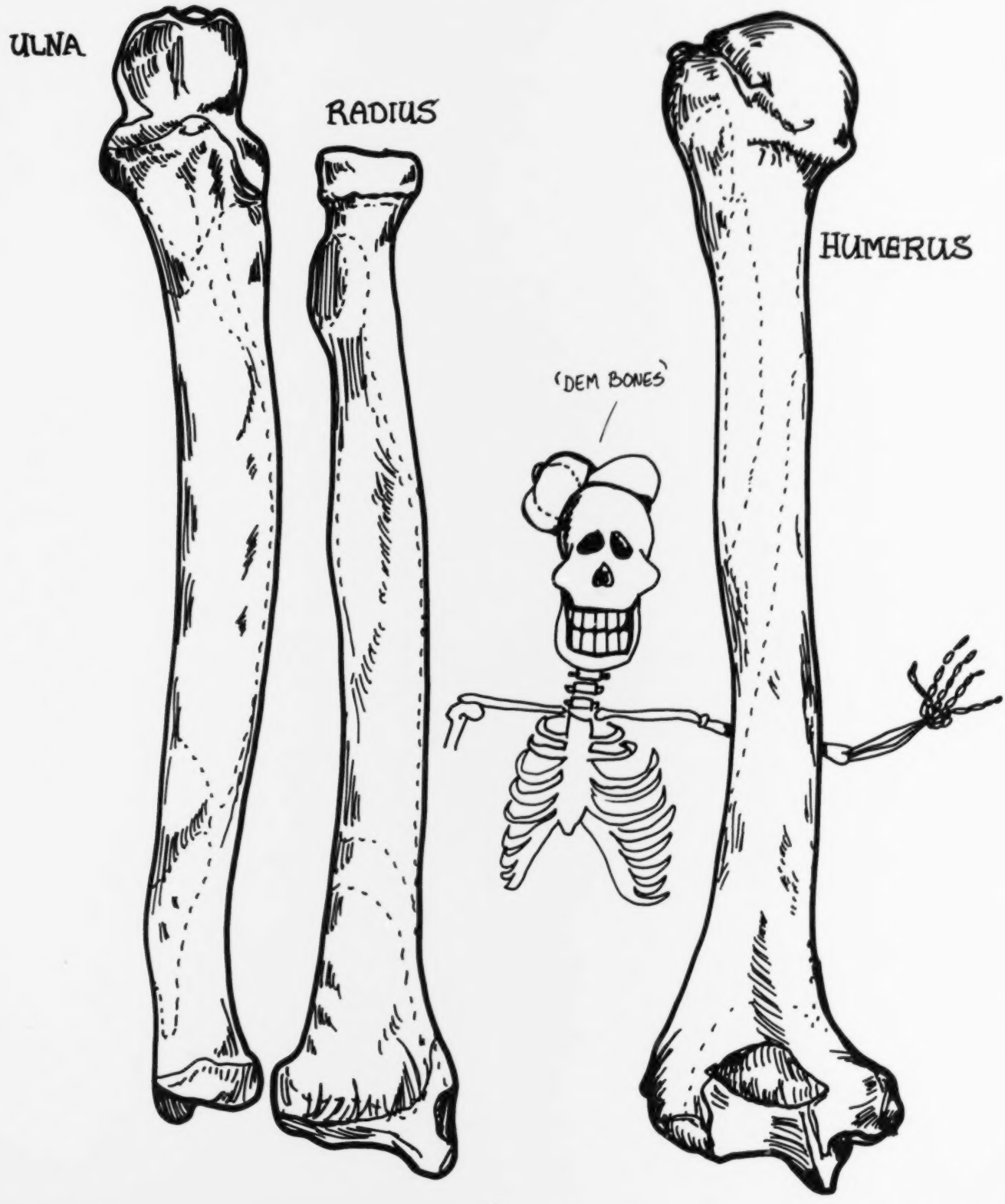
BONES of the LEFT ARM



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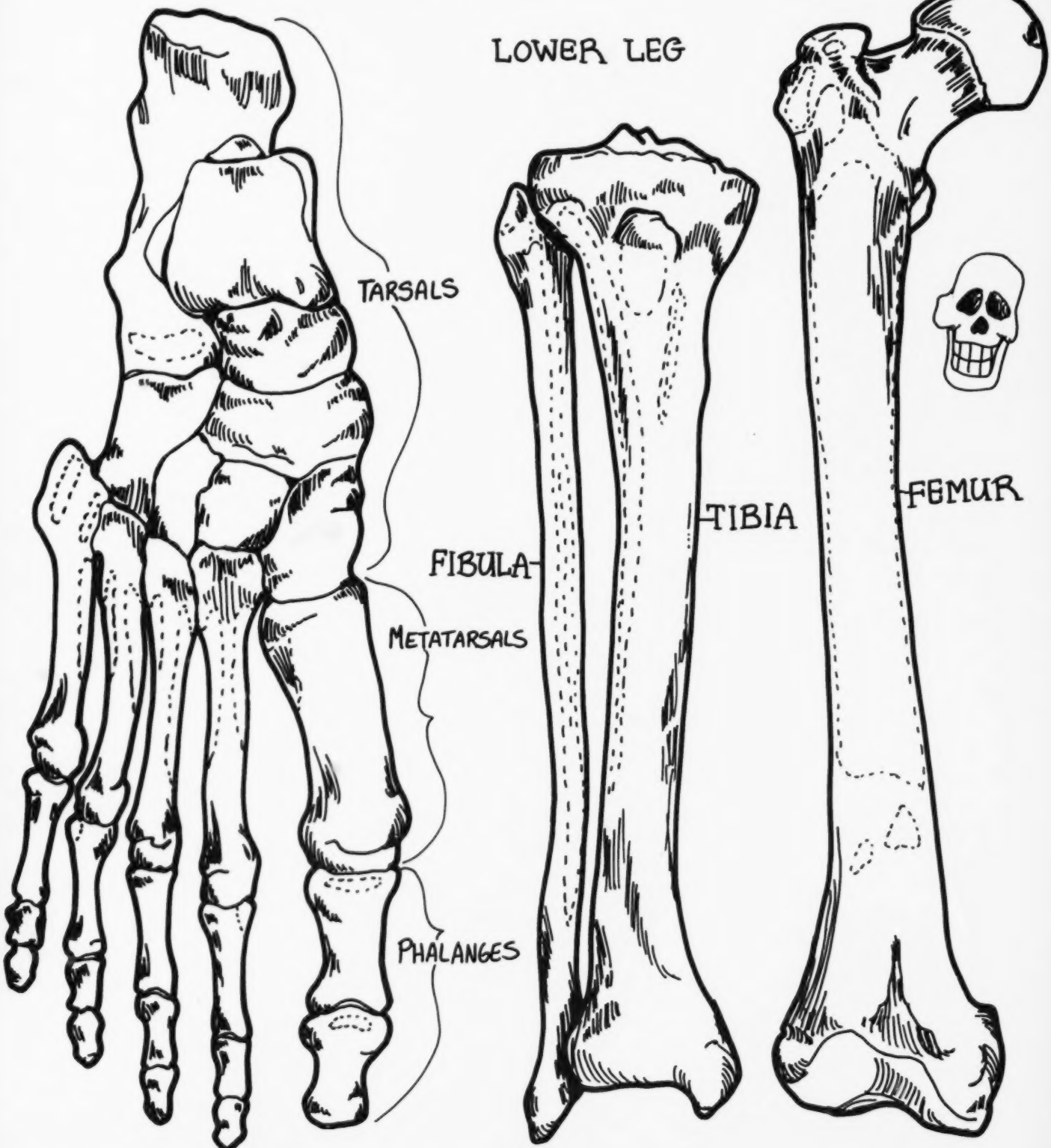
BONES OF RIGHT FOOT

BONES OF RIGHT LEG

'DEM BONES'

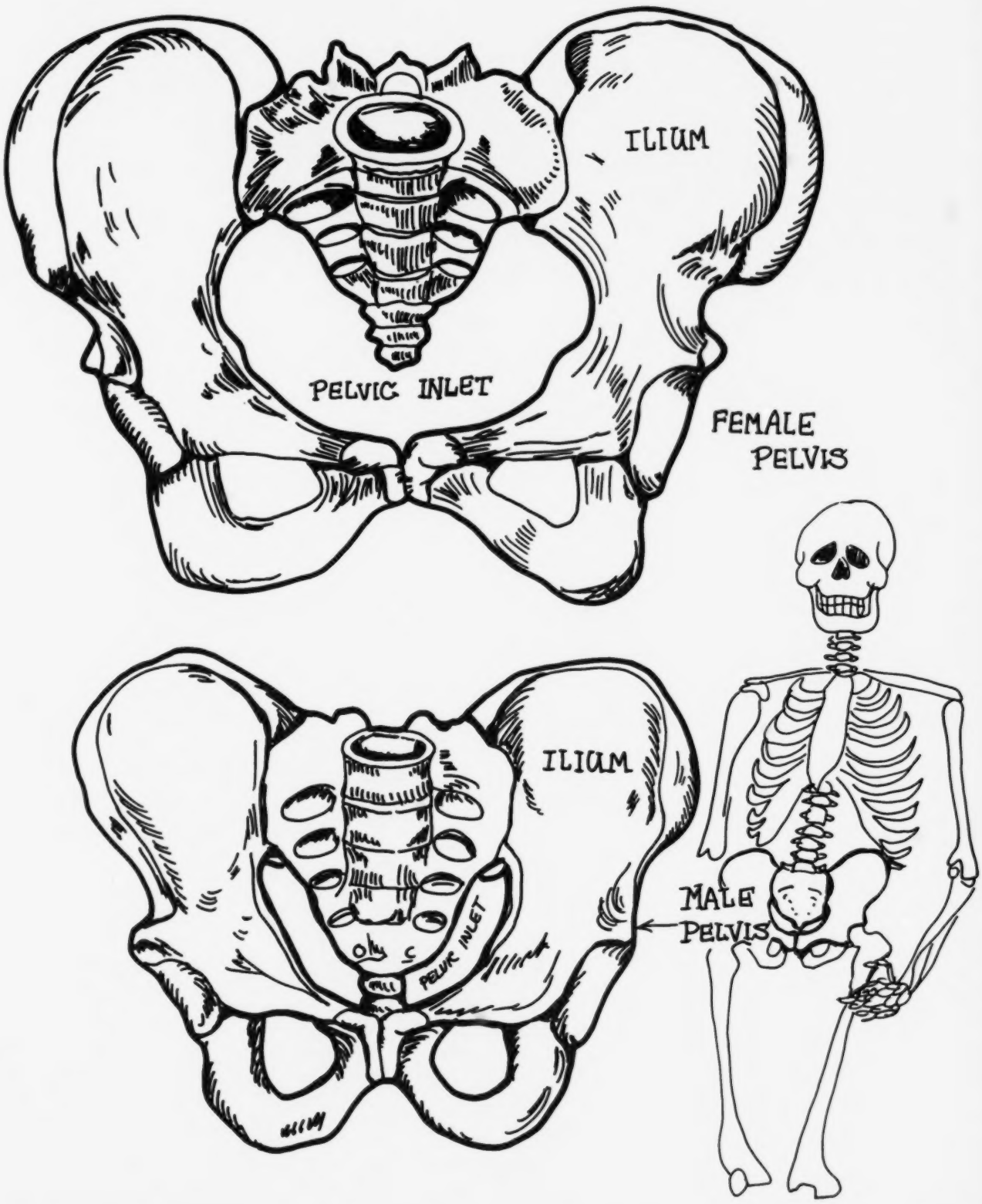
UPPER LEG

LOWER LEG



PELVIS

'DEM BONES'



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ARM YOURSELF

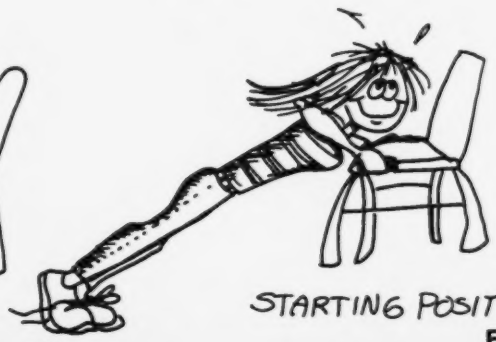
AGE _____
GRADE _____
SEX _____

NAME

PRACTICE & TRY AGAIN!

	TRIAL 1	TRIAL 2
1. NUMBER OF PUSHUPS COMPLETED		
2. PERCENTILE RANKING %		
3. NUMBER OF PUSHUPS CLASS AVERAGE		
4. PERCENTILE RANKING CLASS AVERAGE		
5. DIFFERENCE BETWEEN YOUR SCORE AND CLASS AVERAGE (+ or −)		
6. DIFFERENCE BETWEEN YOUR PERCENTILE AND CLASS AVERAGE (+ or −)		

READY POSITION



STARTING POSITION

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ARM YOURSELF

CHAIR PUSHUPS - PERCENTILE RANKING

NUMBER OF PUSHUPS ACHIEVED

AGE	MALES									PERCENTILE RANKING	FEMALES									AGE
	10	11	12	13	14	15	16	17	18		10	11	12	13	14	15	16	17	18	
	50	52	52	51	—	—	—	—	—	99	31	35	32	35	35	33	35	36	40	
	38	41	44	45	50	50	—	—	—	95	25	29	25	24	27	25	26	25	26	
	31	34	39	40	45	50	50	—	—	90	20	22	21	21	22	21	21	21	21	
	29	31	35	37	42	49	50	51	52	85	18	20	20	18	20	19	20	20	20	
	27	29	32	34	40	45	49	49	51	80	16	18	17	17	18	17	17	17	17	
	24	26	30	31	36	42	47	—	—	75	14	16	16	15	16	15	16	16	15	
	22	24	29	30	34	40	44	48	50	70	13	15	15	14	15	14	15	15	14	
	20	22	26	27	31	39	41	47	—	65	11	13	13	13	14	13	13	14	13	
	18	20	24	25	30	36	40	44	49	60	10	12	12	12	13	12	12	13	—	
	16	19	22	23	27	34	37	42	46	55	9	11	11	11	12	11	11	12	12	
	15	16	21	21	25	31	35	40	43	50	8	10	10	10	10	10	10	11	—	
	14	15	20	20	24	30	33	38	41	45	7	8	9	8	9	9	9	—	11	
	13	13	18	19	22	29	31	36	40	40	6	7	7	7	8	8	8	10	10	
	12	12	16	17	21	26	30	33	37	35	5	6	6	6	7	7	7	9	9	
	11	10	14	15	20	24	28	31	35	30	—	5	5	5	6	6	6	8	7	
	10	9	13	14	18	22	25	27	31	25	4	4	4	4	5	5	5	7	6	
	8	8	11	12	16	20	23	25	30	20	3	3	3	3	4	4	4	6	5	
	7	7	9	10	13	18	20	24	26	15	2	2	—	2	3	3	3	5	4	
	5	5	7	8	10	15	18	21	21	10	—	—	2	—	2	2	2	3	3	
	3	3	4	5	7	11	12	18	15	5	1	1	1	1	1	1	1	2	2	

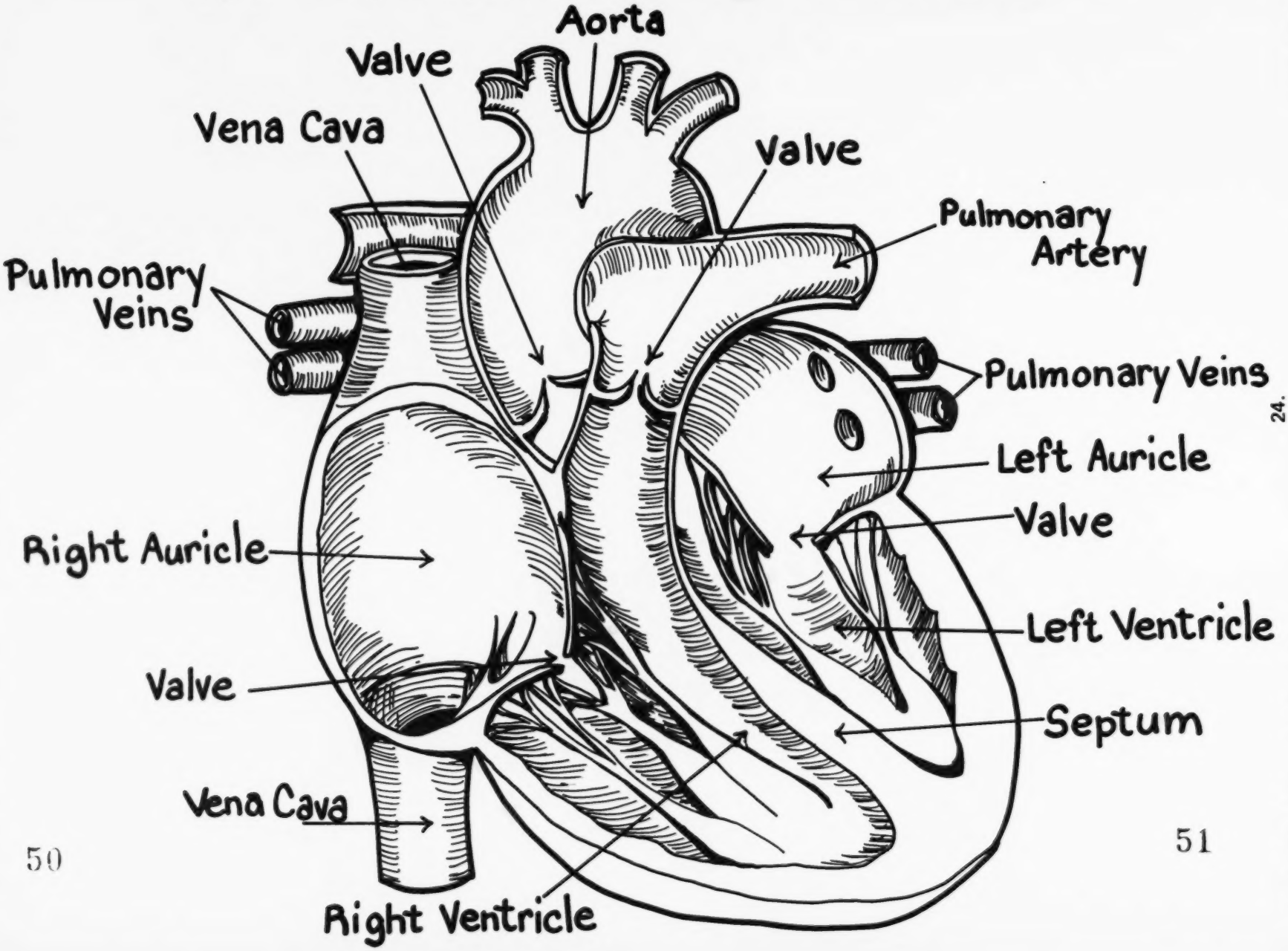
NUMBER OF PUSHURS ACHIEVED

CLASS RECORDING SHEET

ARM YOURSELF

	NAME	# OF PUSHUPS TRIAL 1	PERCENTILE RANKING	# OF PUSHUPS TRIAL 2	PERCENTILE RANKING
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					
15.					
16.					
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					
31.					
32.					
33.					
	CLASS TOTAL				
	CLASS AVERAGE (CLASS TOTAL ÷ NUMBER OF STUDENTS)				

'YA GOTTA' HAVE HEART!



From Head to Toe

24.

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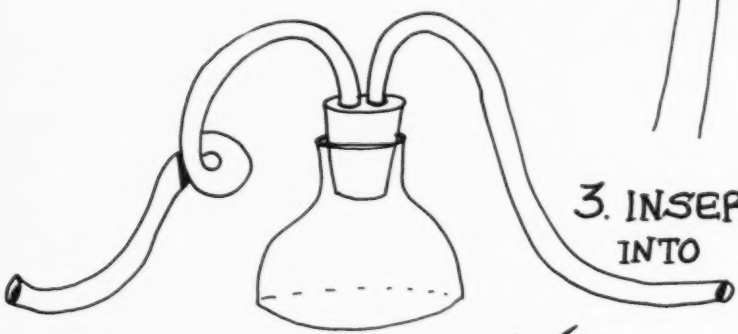
'YA GOTTA' HAVE HEART!

CREATE YOUR OWN STETHOSCOPE

1. CUT OFF THE TOP OF A PLASTIC BOTTLE.

2. INSERT RUBBER TUBING INTO A 2 HOLE STOPPER (6 or 6½)



3. INSERT RUBBER STOPPER INTO OPENING AT TOP OF BOTTLE TOP.

4. PLACE END OF TUBING INTO EARS NOT TOO FAR!!! (¼ INCH)

5. PLACE OPEN END OF PLASTIC BOTTLE OVER HEART AND LISTEN!

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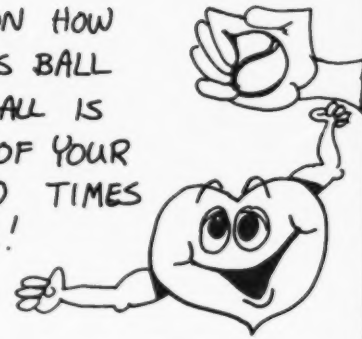
name _____

'YA GOTTA' HAVE HEART!

TRY TO DO THE HEART'S WORK

THE HEART IS A MOST POWERFUL MUSCLE. TO GET A GRASP ON HOW HARD IT WORKS FOR YOU — TRY THIS EXPERIMENT. TAKE A TENNIS BALL IN YOUR HAND. THE FORCE NEEDED TO SQUEEZE THE TENNIS BALL IS SIMILAR TO THE FORCE NEEDED TO SQUEEZE THE BLOOD OUT OF YOUR HEART. SQUEEZE THE BALL 10 TIMES. NOW, SQUEEZE IT 60 TIMES A MINUTE. YOU NOW HAVE AN IDEA OF HOW HARD YOUR HEART WORKS!



NEXT: IT IS POSSIBLE TO CALCULATE YOUR OWN HEART'S STROKE VOLUME - (the amount of blood pumped in one beat of your heart). USE THE SURFACE AREA OF THE HEART CHART AT THE RIGHT. FIND YOUR HEIGHT; THE SURFACE AREA OF YOUR HEART IS BESIDE YOUR HEIGHT IN THE CHART. RECORD BELOW. NOW, MULTIPLY YOUR SURFACE AREA X 3.1 TO GET YOUR CARDIAC OUTPUT. TAKE YOUR CARDIAC OUTPUT AND DIVIDE IT BY YOUR PULSE RATE AT REST. THIS IS YOUR STROKE VOLUME OR HOW MUCH BLOOD YOUR HEART PUMPS IN ONE BEAT!

HEIGHT	SURFACE AREA X 3.1 = CARDIAC OUTPUT ÷ PULSE RATE = STROKE VOLUME
	(NORMAL) (LITERS OF BLOOD)
	_____ X 3.1 = _____ ÷ _____ = _____

While at Rest — HOW MANY LITERS OF BLOOD DOES YOUR HEART PUMP IN 1 MINUTE_____ 1 HOUR_____ 1 DAY_____?

SURFACE AREA OF THE HEART

HEIGHT	SURFACE AREA
4'11'	1.25
4'2"	1.30
4'3"	1.35
4'4"	1.4
4'5"	1.43
4'6"	1.45
4'7"	1.5
4'8"	1.55
4'9"	1.6
4'10"	1.65
4'11"	1.68
5'	1.7
5'1"	1.75
5'2"	1.8
5'3"	1.85
5'4"	1.9
5'5"	1.93
5'6"	1.95
5'7"	2.0
5'8"	2.05
5'9"	2.1
5'10"	2.15
5'11"	2.18
6'	2.2

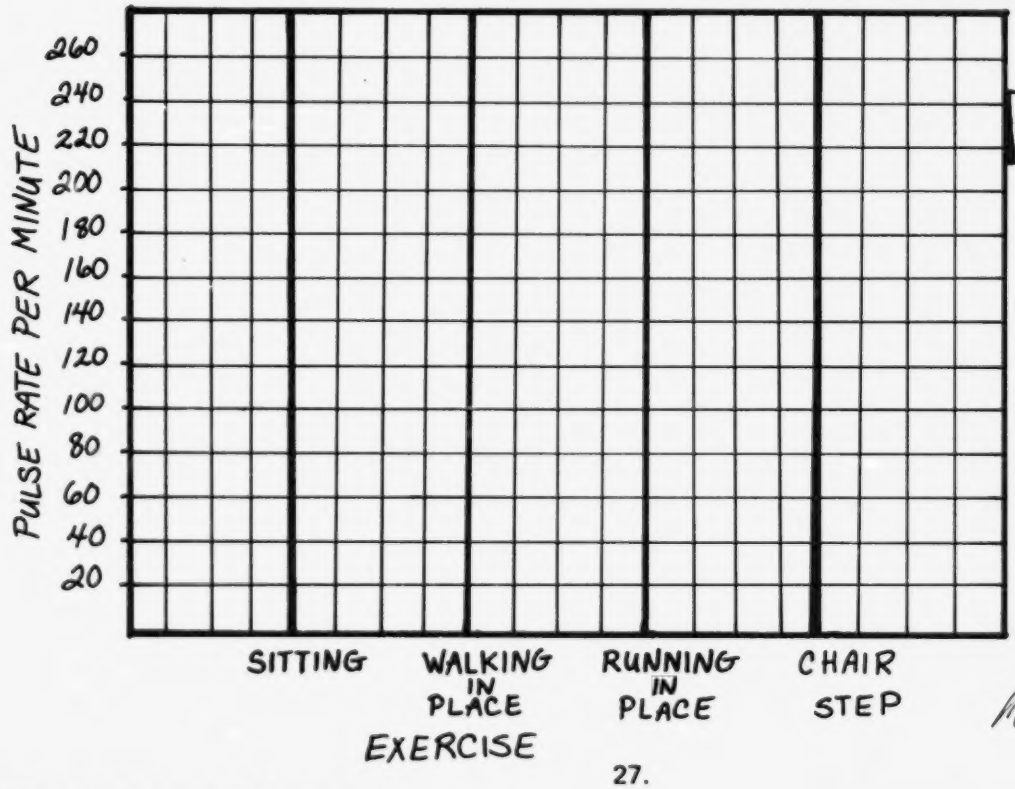
NAME _____

HOW DOES YOUR HEART RATE?

SIT QUIETLY FOR 3 MINUTES. TAKE YOUR PULSE AND RECORD. DO THESE EXERCISES FOR 1 MINUTE - TAKE YOUR PULSE FOR 10 SECONDS AND RECORD.

	PULSE RATE FOR 10 SECONDS	X 6 =	PULSE RATE FOR 1 MINUTE
SITTING	_____		_____
WALKING IN PLACE	_____		_____
JUMPING JACKS	_____		_____
CHAIR STEPS	_____		_____

GRAPH YOUR RESULTS:



27.

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Name _____

How Does Your Heart Rate?

Pulse Rate - Stroke Volume

Take your pulse rate for 10 seconds after each of these exercises. Multiply by six (6) to find your pulse rate for 1 minute. Next, multiply your heart rate per minute x your stroke volume to find the liters of blood per minute your heart is pumping.

	Pulse Rate (x6) 10 seconds / Pulse Rate (x) 1 minute	stroke (=) Volume	Liters of Blood per Min.
At Rest			
Walking for 1 minute			
Running in place for 1 minute			
Jumping Jacks for 1 minute			
Sit-ups for 1 minute			
Jumping Rope for 1 minute			
1 50 meter Dash			
4-50 meter Dashes			

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Name _____

How Does Your Heart Rate?

Breath Rate - Lung Capacity

Since you will be counting your pulse rate, you will need a partner to count your breath rate. After each exercise, your partner will count how many breaths you take in 10 seconds. Record on the chart below. Multiply that number X 6 to get your breath rate per minute. Next, multiply your breath rate per minute X your lung capacity to find how many liters of air per minute you are breathing.

	Breath Rate 10 seconds	/ 1 minute	(X) Lung Capacity	(=) Liters of Air per Minute
At Rest				
Walking for 1 minute				
Running in place for 1 minute				
Jumping Jacks for 1 minute				
Sit - ups for 1 minute				
Jumping Rope for 1 minute				
1 50 meter Dash				
4 - 50 meter Dashes				

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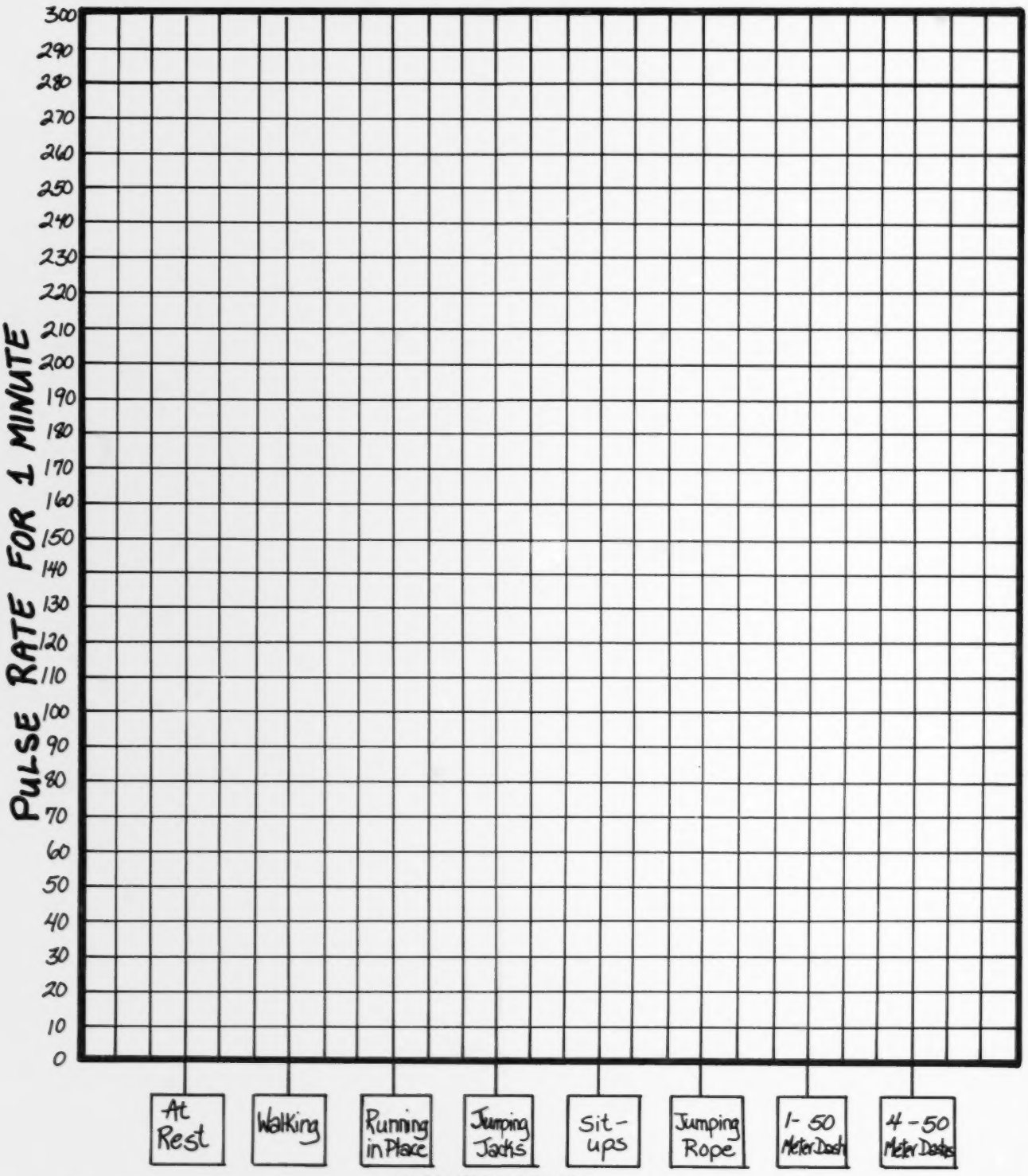
Name _____

How Does Your Heart Rate?

Pulse Rate After Exercise



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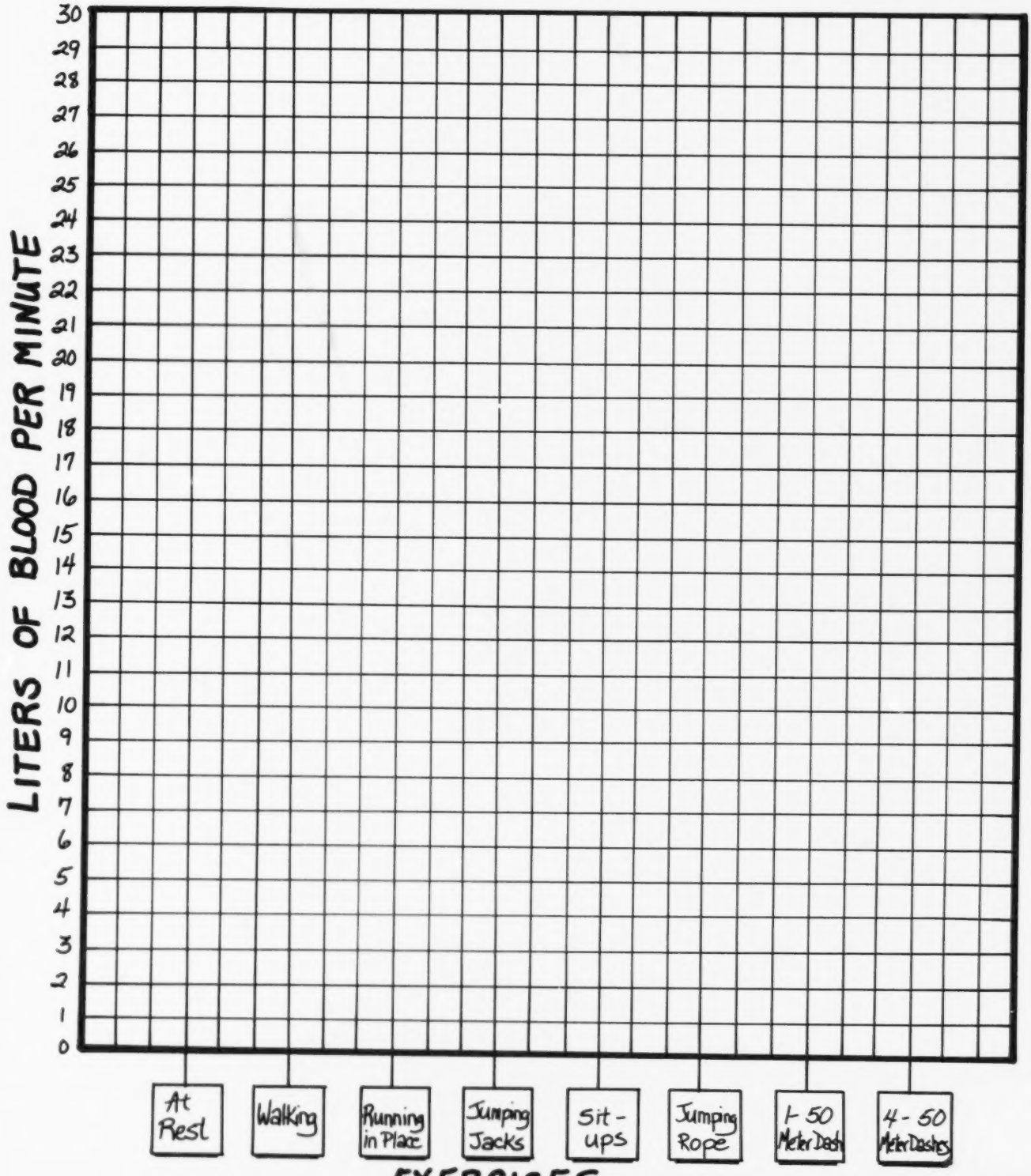
_____ Name

How Does Your Heart Rate?

LITERS OF BLOOD Pumped BY THE HEART



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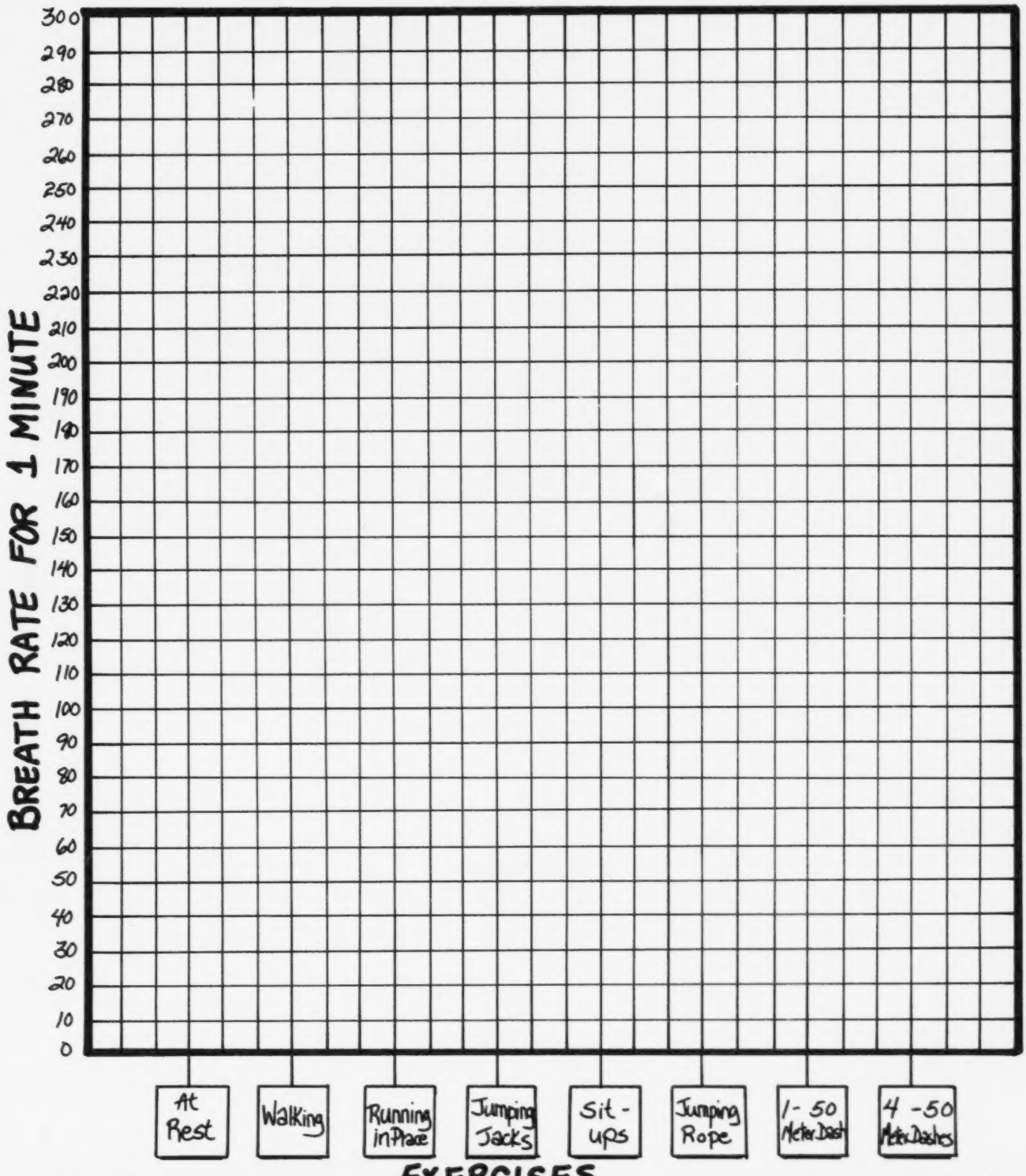
Name _____

How Does Your Heart Rate?

BREATH RATE AFTER EXERCISE



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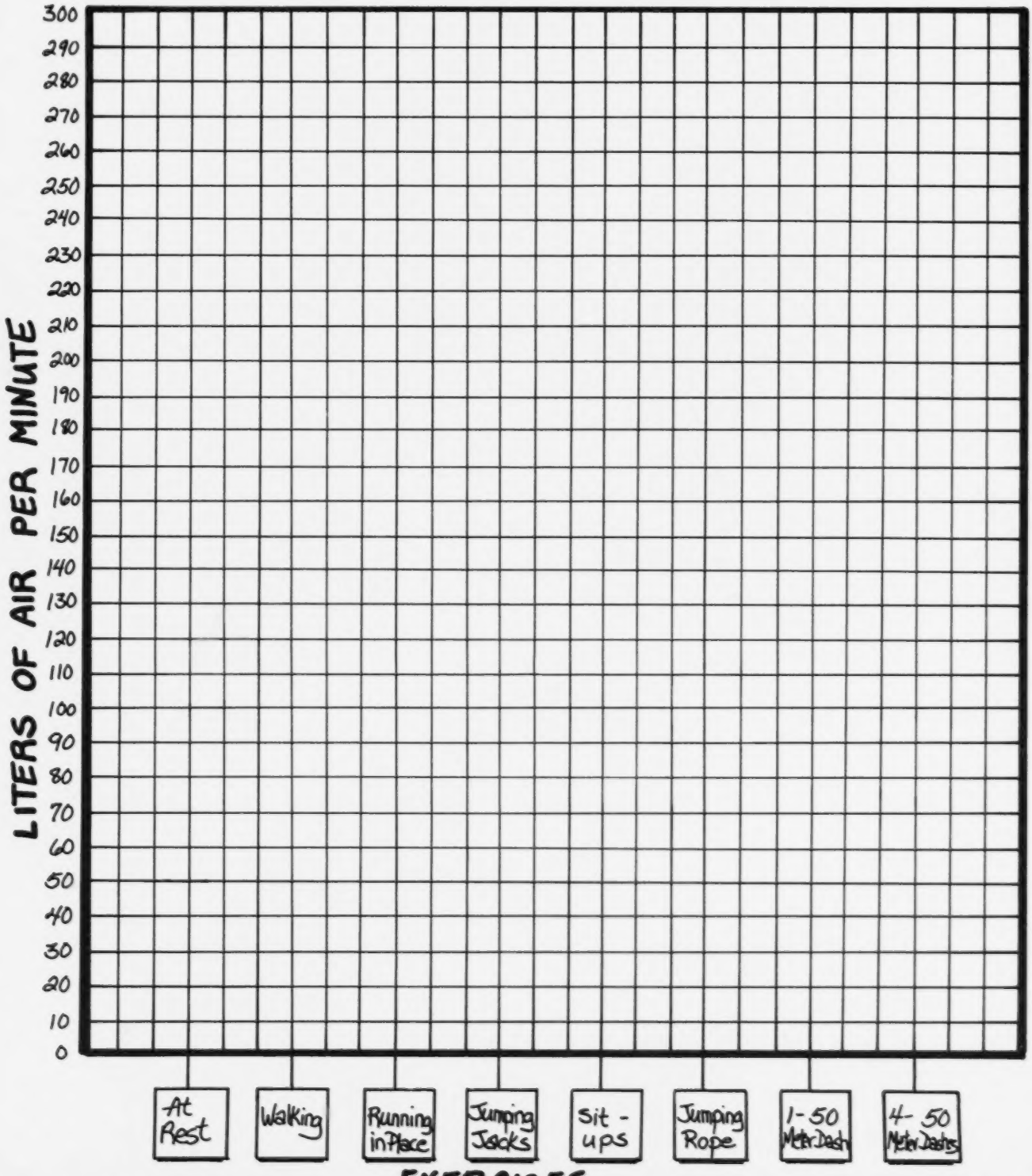
_____ Name

How Does Your Heart Rate?

LITERS OF AIR BREATHED



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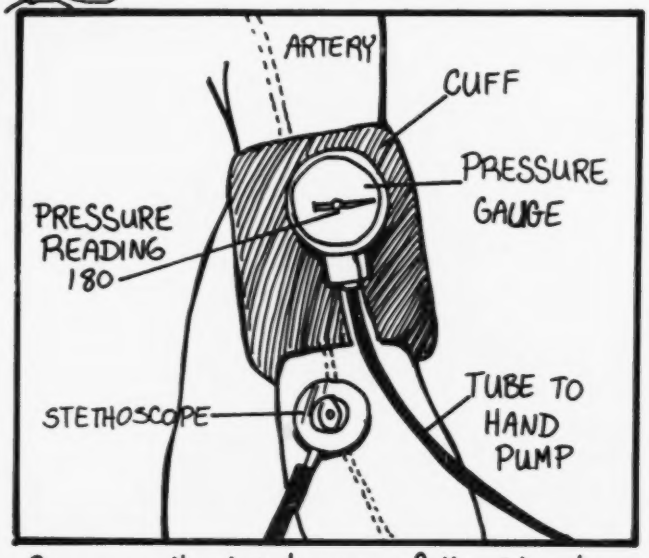
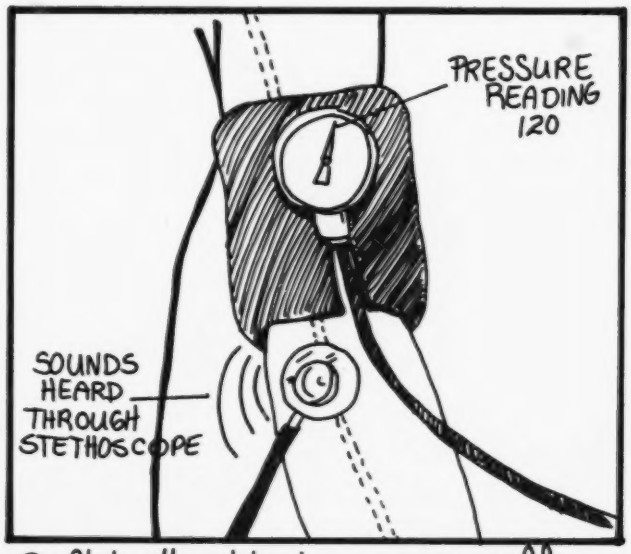
The Pressure's On

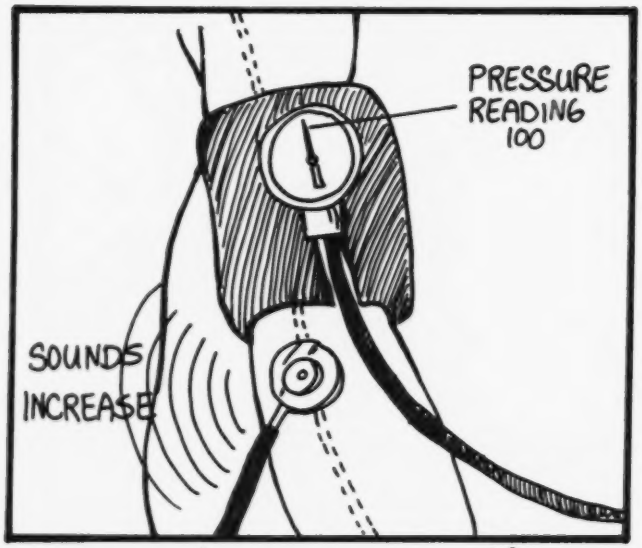
name _____



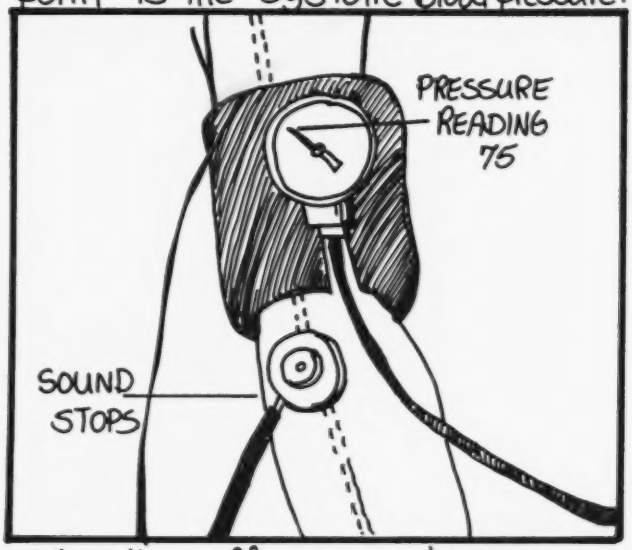
Squeeze the hand pump of the blood pressure cuff until the pressure gauge reads 180. The arterial blood flow is now momentarily blocked.



Deflate the blood pressure cuff until you hear the blood begin to squirt through the artery. Whatever pressure reading appears at this point is the systolic blood pressure.



As you decrease the cuff pressure, sounds in the stethoscope will increase as more blood rushes through the artery.



When the cuff pressure decreases enough to let the blood flow freely, all sounds in the stethoscope stop. The pressure reading at the moment the sound stops is the diastolic blood pressure.

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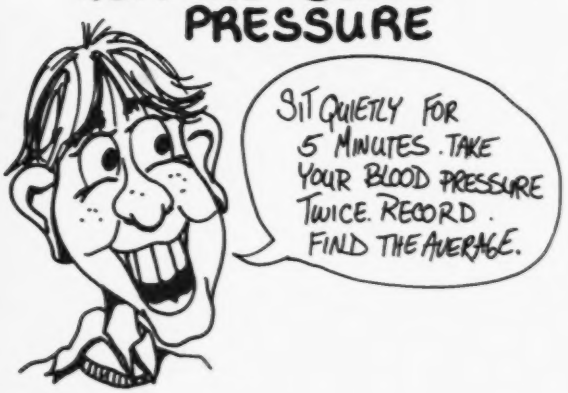
NAME _____

The Pressure's On

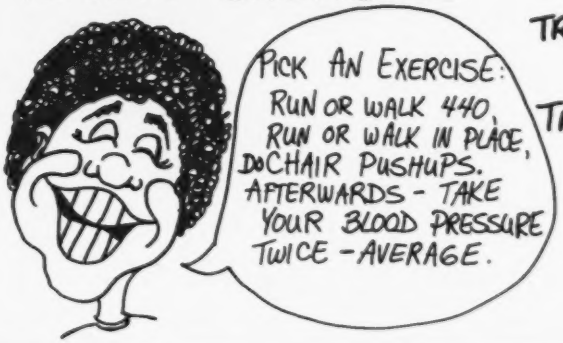
SYSTOLIC
DIASTOLIC

NORMAL BLOOD PRESSURE



	BLOOD PRESSURE SYSTOLIC	/	DIASTOLIC
TRIAL #1	_____	/	_____
TRIAL #2	_____	/	_____
TOTAL	_____	/	_____
AVERAGE	_____	/	_____

BLOOD PRESSURE AFTER EXERCISE



	BLOOD PRESSURE SYSTOLIC	/	DIASTOLIC
TRIAL #1	_____	/	_____
TRIAL #2	_____	/	_____
TOTAL	_____	/	_____
AVERAGE	_____	/	_____

	BLOOD PRESSURE SYSTOLIC	/	DIASTOLIC
NORMAL	_____	/	_____
AFTER EXERCISE	_____	/	_____
DIFFERENCE	_____	/	_____

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The Pressure's On

SYSTOLIC
DIASTOLIC

MASTER AVERAGE SHEET

	NAME	BLOOD PRESSURE SYSTOLIC/DIASTOLIC
1.		/
2.		/
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27.		/
28.		/
29.		/
30.		/
31.		/
32.		/
33.		/
	CLASS TOTAL	/
	CLASS AVERAGE	/

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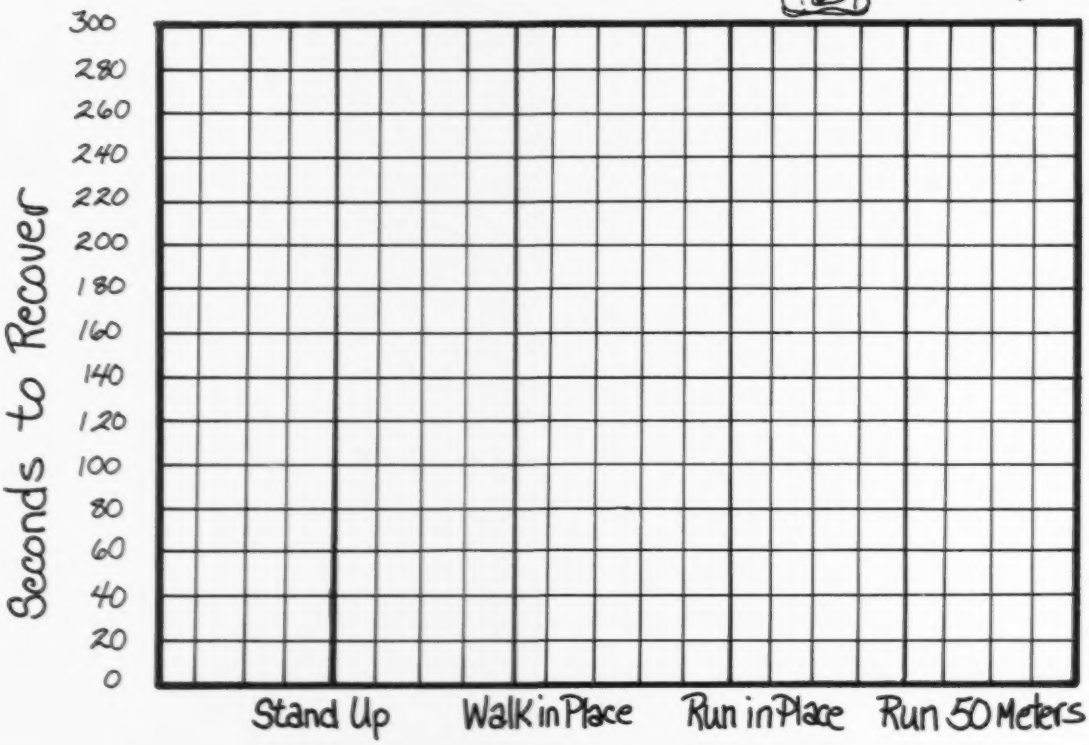
Step In Time

Name _____

How Fast Does Your Heart Return To Its Resting Rate After Different Activities?

	Pulse Rate (For 10 Seconds) x6 (For 1 Minute)	Recovery Time
Lie Flat on Back		0 sec.
Sit in chair (Resting Rate)		0 sec.
Sit then stand up		sec.
Walk in Place		sec.
Run in Place		sec.
Run 50 Meters		sec.

After You Record All Your Data, Make a Line Graph to Show Your Recovery Time



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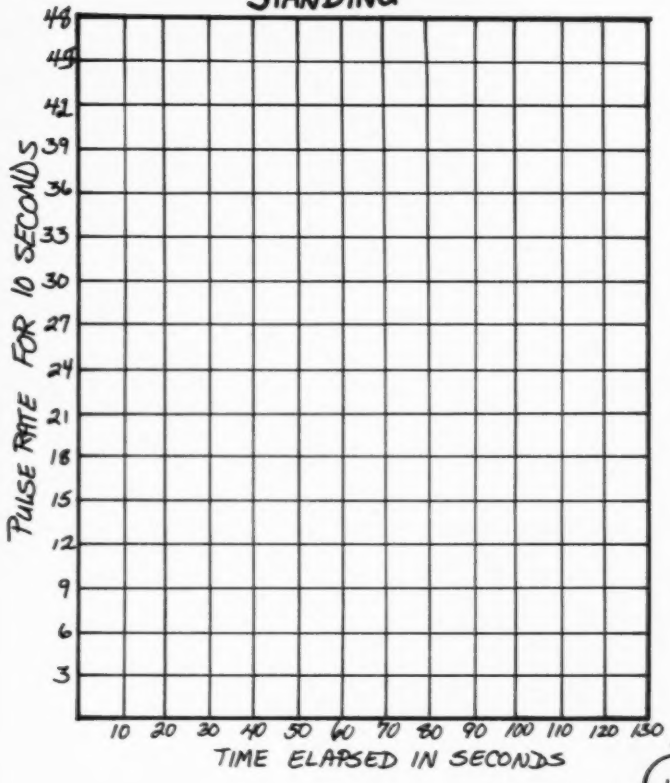
RECOVERY TIME

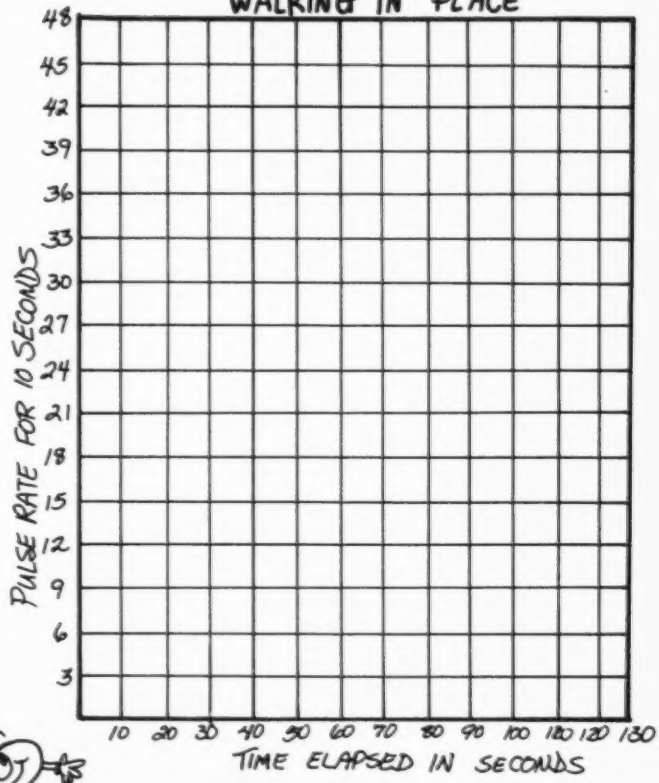
Step In Time

Name _____

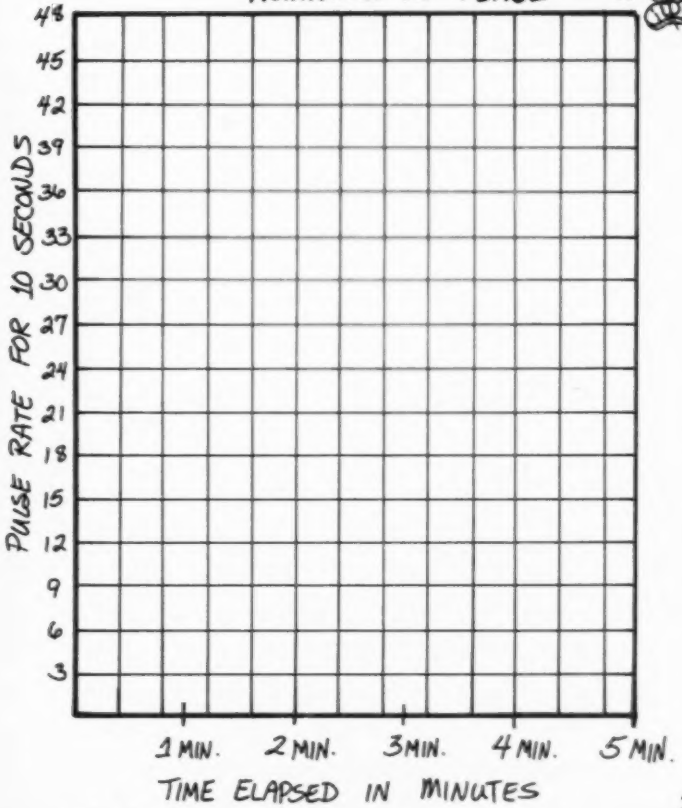
STANDING



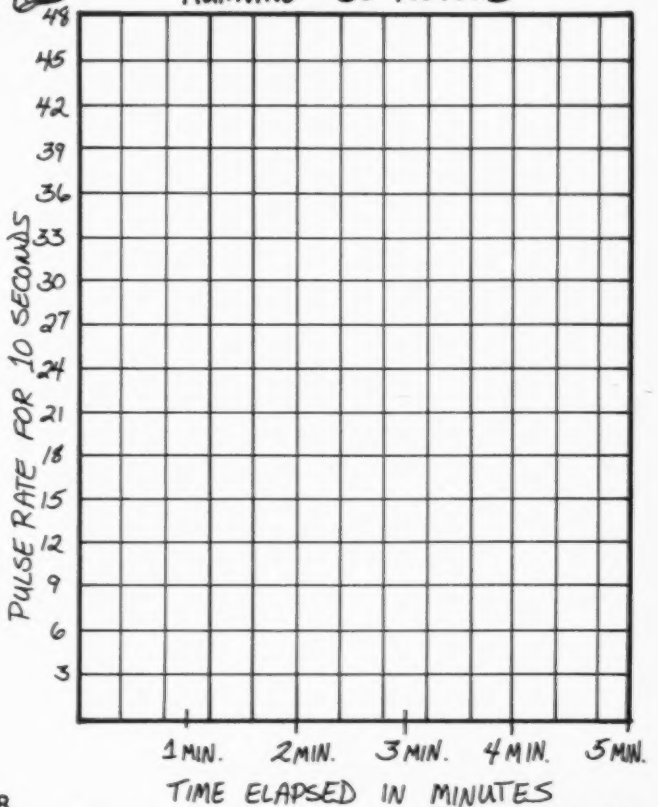
WALKING IN PLACE



RUNNING IN PLACE



RUNNING 50 METERS



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Temperature's Rising!

Personal Temperature Cycle

for :

Take Your Temperature every 2 Hours and Record.

7:00 A.M. _____

9:00 A.M. _____

11:00 A.M. _____

1:00 P.M. _____

3:00 P.M. _____

5:00 P.M. _____

7:00 P.M. _____

9:00 P.M. _____

TOTAL _____

AVERAGE _____

What time was your temperature highest? _____

What time was your temperature lowest? _____

How does your average temperature compare with normal 98.6° ? _____

_____

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Name _____

Temperature's Rising!

Group Recording Sheet

Group Name _____

Exercise _____

Name	Preactivity Temperature	Postactivity Temperature	Difference + or -
1.			
2.			
3.			
4.			
5.			
6.			
Totals			
Averages			

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_____ NAME

AM I YOUR TYPE?

1. STERILIZE TIP OF INDEX FINGER WITH ALCOHOL PAD. ALLOW TO AIR DRY.
2. APPLY FORCE WITH YOUR THUMB TO THE BASE OF FIRST JOINT OF INDEX FINGER.
3. TAKE THE LANCET BETWEEN YOUR INDEX FINGER AND THE THUMB OF YOUR WORKING HAND. LINE UP TIP WITH THE PAD OF THE INDEX FINGER. WITH A SHORT FORCEFUL JAB, POKE ONE HOLE IN TIP OF INDEX FINGER.

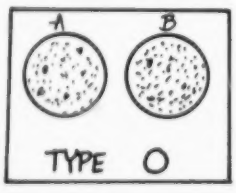
4. BLOT FIRST DROP OF BLOOD ON ALCOHOL PAD. PLACE LANCET ON PAPER TOWEL FOR LATER DISPOSAL. USING YOUR THUMB, SQUEEZE ONE DROP OF BLOOD FROM FINGERTIP - PLACE DROP IN CIRCLE A. PLACE A SECOND DROP IN CIRCLE B. RAISE YOUR HAND TO RECEIVE ANTI-GLUTENS. (PLACE ALCOHOL PAD ON PUNCTURE AND HOLD IN PLACE WITH YOUR THUMB.)

5. AFTER RECEIVING ANTI-A AND ANTI-B SOLUTIONS, STIR ANTI-A CIRCLE THOROUGHLY WITH SIDE OF TOOTHPICK. BE SURE TO SPREAD MIXTURE OUT TO FILL ENTIRE CIRCLE. DISCARD TOOTHPICK ON PAPER TOWEL. GET A SECOND TOOTHPICK AND REPEAT OPERATION FOR ANTI-B CIRCLE. DISCARD TOOTHPICK ONTO PAPER TOWEL.

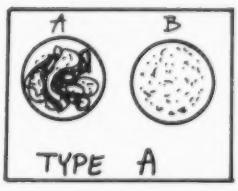
6. PICK UP HEMO-CARD AND GENTLY ROCK FOR ABOUT ONE/TWO MINUTES. SET CARD DOWN AND WATCH RESULTS. RECORD YOUR BLOOD TYPE.

I HAVE BLOOD TYPE _____.

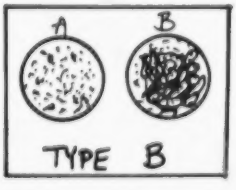
IF A & B REMAIN THE SAME - YOU HAVE BLOOD TYPE O.



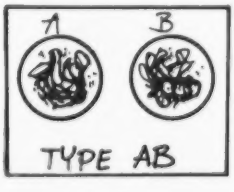
IF CIRCLE A SHOWS CLOTTING AND B DOESN'T, YOU ARE TYPE A.



IF CIRCLE B CLOTS AND A REMAINS UNCHANGED, YOU HAVE TYPE B.



IF BOTH CIRCLE A AND B CLOT, YOU HAVE AB BLOOD.



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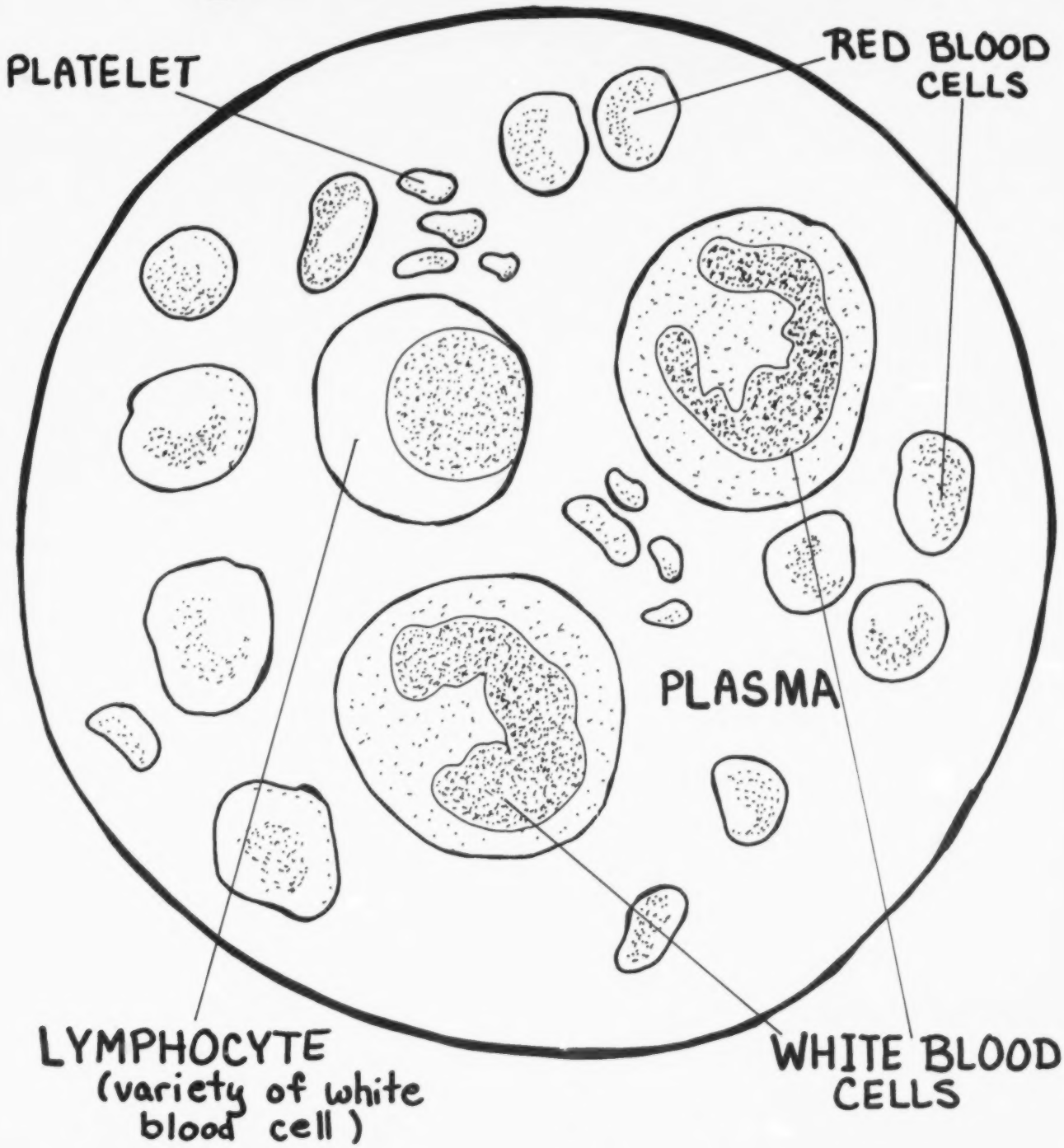
NAME _____

AM I YOUR TYPE?
Ingredients in Blood



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AM I YOUR TYPE?

NAMES	BLOOD TYPE A	B	O	A/B
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
	A	B	O	A/B

NAMES	BLOOD TYPE A	B	O	A/B
18.				
19.				
20.				
21.				
22.				
23.				
24.				
25.				
26.				
27.				
28.				
29.				
30.				
31.				
32.				
33.				
34.				
	A	B	O	A/B

43.

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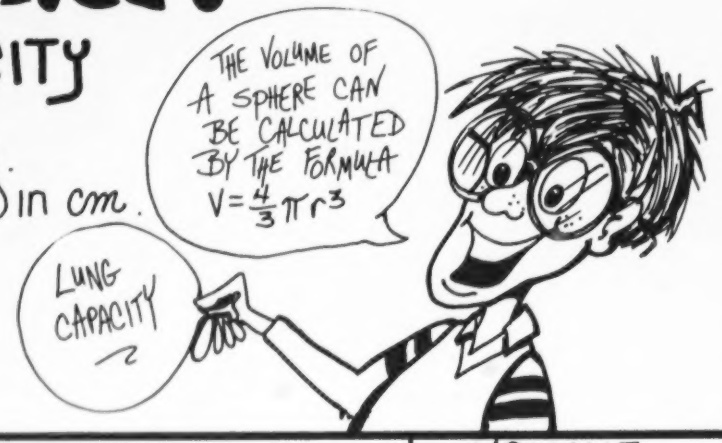
Take A Breather!

NAME _____

PERSONAL LUNG CAPACITY

1. BLOW UP A BALLOON (SPHERE).
2. MEASURE ITS CIRCUMFERENCE(C) IN cm.
3. RECORD
4. FIND THE VOLUME
5. MAKE 4 TRIALS
6. FIND THE AVERAGE



TRIAL#	CIRCUMFERENCE C		$C \div \pi(3.14) =$ DIAMETER(d)	$D \div d \div 2 =$ RADIUS(r)	$r^3 =$ r x r x r x $\pi(3.14)$ x 4/3 =	VOLUME cm^3	VOLUME liters
1		cm	$\frac{C=}{3.14} = d$	$\frac{d=}{2} = r$	$r^3=$ _____ x π = _____ x $\frac{4}{3}$ =		
2		cm	$\frac{C=}{3.14} = d$	$\frac{d=}{2} = r$	$r^3=$ _____ x π = _____ x $\frac{4}{3}$ =		
3		cm	$\frac{C=}{3.14} = d$	$\frac{d=}{2} = r$	$r^3=$ _____ x π = _____ x $\frac{4}{3}$ =		
4		cm	$\frac{C=}{3.14} = d$	$\frac{d=}{2} = r$	$r^3=$ _____ x π = _____ x $\frac{4}{3}$ =		
					Total		
					Average		

REPORTER _____

Take A Breather!

INTERVIEW SHEET

NAME _____
DATE _____
SEX _____
AGE _____
HEIGHT _____
WEIGHT _____
MINUTES OF STRENUOUS EXERCISE PER DAY _____
SMOKING HABITS
#OF PACKS PER DAY _____

LUNG CAPACITY

AFTER YOU BREATHE OUT NORMALLY, BLOW THE REST (RESERVE) OF YOUR AIR INTO THE BALLOON. MEASURE THE CIRCUMFERENCE AND RECORD
TAKE THE DEEPEST BREATH YOU CAN . . . . BLOW EVERY BIT OF YOUR AIR INTO THE BALLOON. MEASURE THE CIRCUMFERENCE AND RECORD.

RESERVE AIR CAPACITY

TRIAL #1	
TRIAL #2	
TRIAL #3	
TOTAL	
AVERAGE	

VITAL CAPACITY

TRIAL #1	
TRIAL #2	
TRIAL #3	
TOTAL	
AVERAGE	

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VITAL AIR VOLUME [ ] COLOR

TAKE A BREATHER

(Factors Affecting Lung Capacity)

RESERVE AIR VOLUME [ ] COLOR

AGE IN YEARS

HEIGHT IN CM

CIRCUMFERENCE OF BALLOON IN CM	MALES	FEMALES	0-5	6-10	11-15	16-20	21-30	31-40	41-50	51-60	60-70	>70	100	110	120	130	140	150	160	170	180	190	200
120																							
100																							
90																							
80																							
70																							
60																							
50																							
40																							
30																							
20																							
10																							

46.

MASTER DATA SHEET

WEIGHT IN POUNDS

MINUTES OF EXERCISE

SMOKING HABITS-# OF PACKS PER DAY

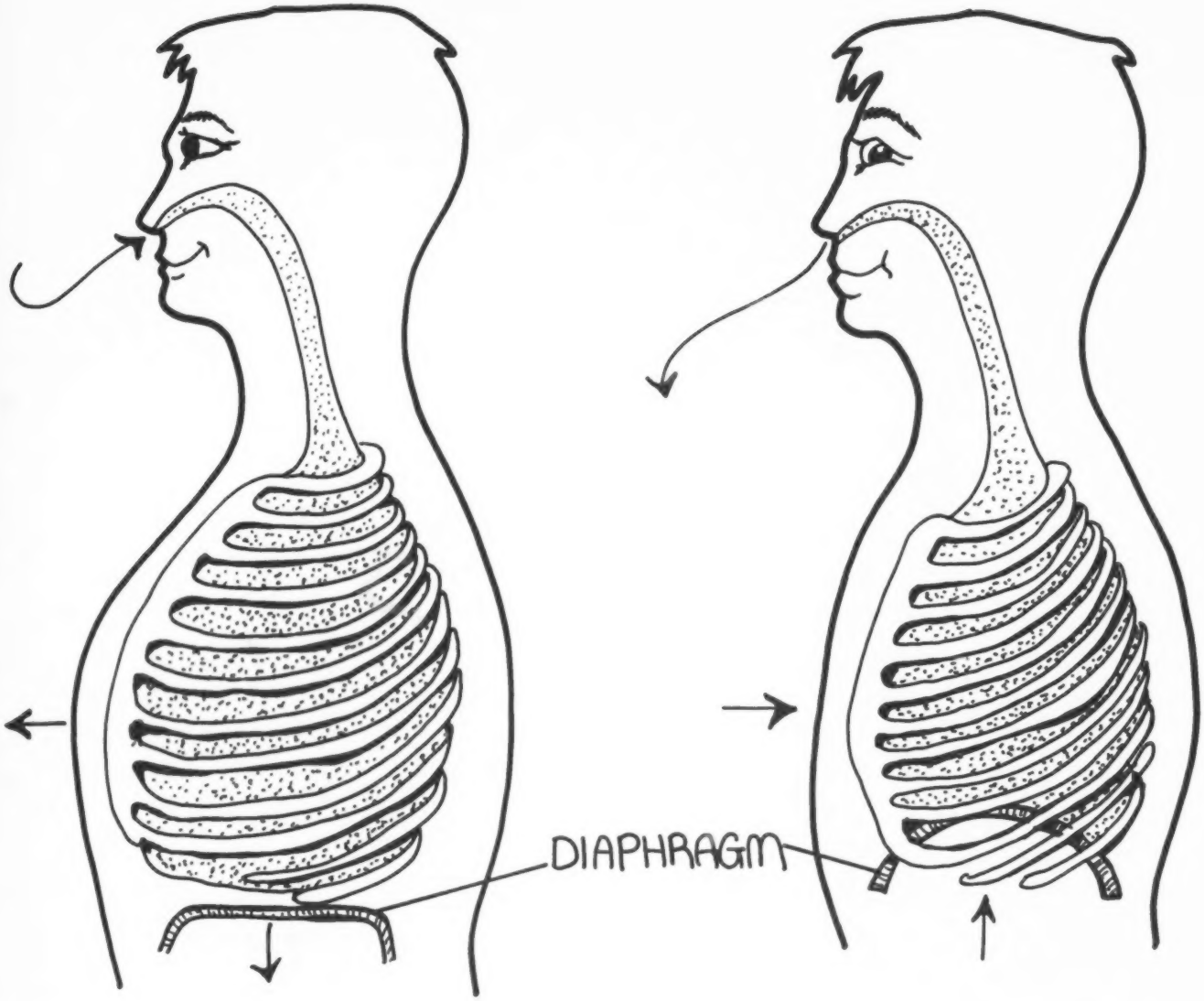
CIRCUMFERENCE OF BALLOON IN CM	BELOW 50	51-75	76-100	100-125	126-150	151-175	176-200	7200	<20	20	30	40	50	60	70	80	90	100	>100	NON SMOKER	$< \frac{1}{2}$	$\frac{1}{2}$-1	1-2	2-3	>3
120																									
100																									
90																									
80																									
70																									
60																									
50																									
40																									
30																									
20																									
10																									

From Head to Toe

NAME _____

Take A Breather!

BREATHING



INSPIRATION

EXPIRATION

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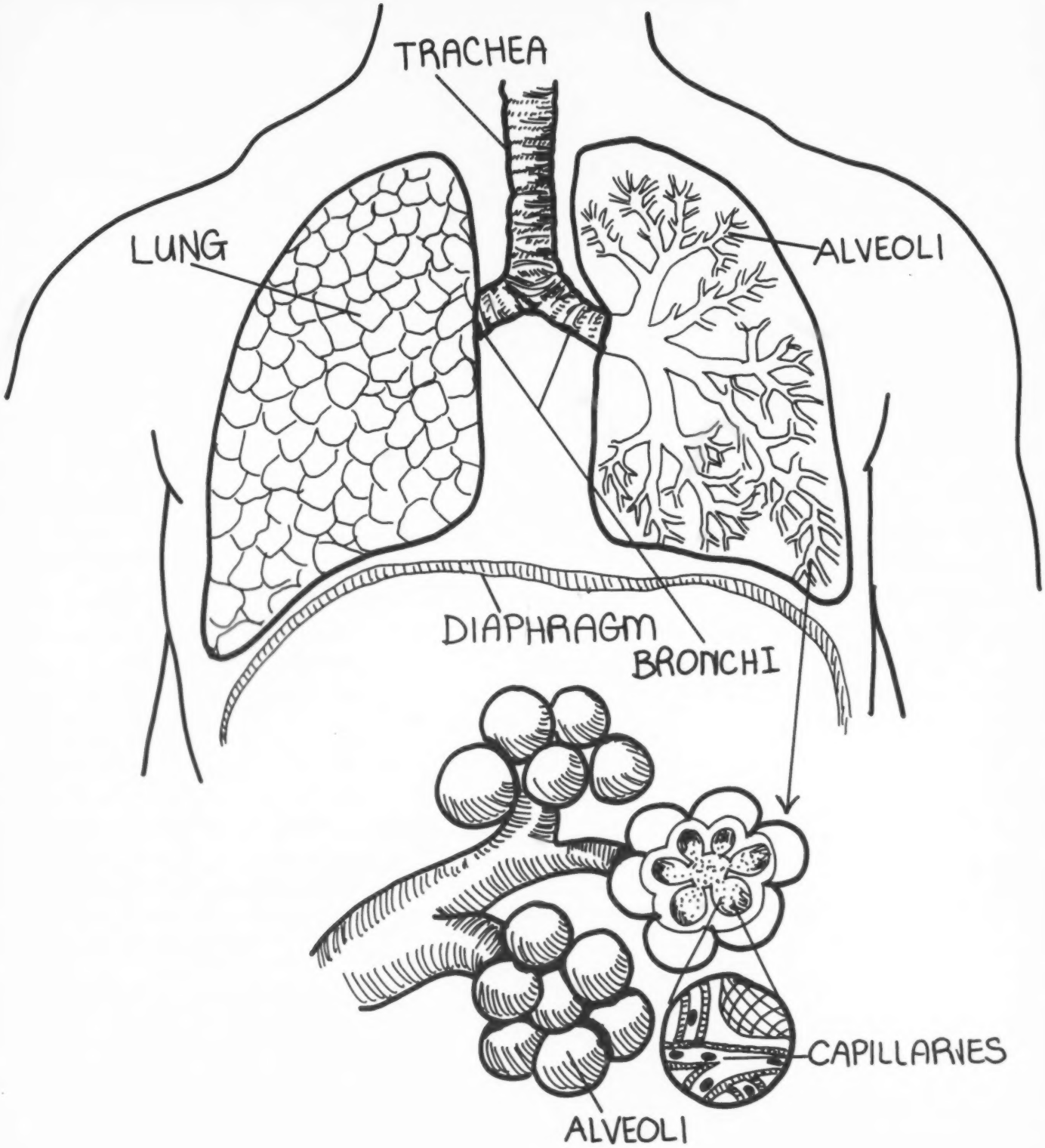
NAME

Take A Breather!



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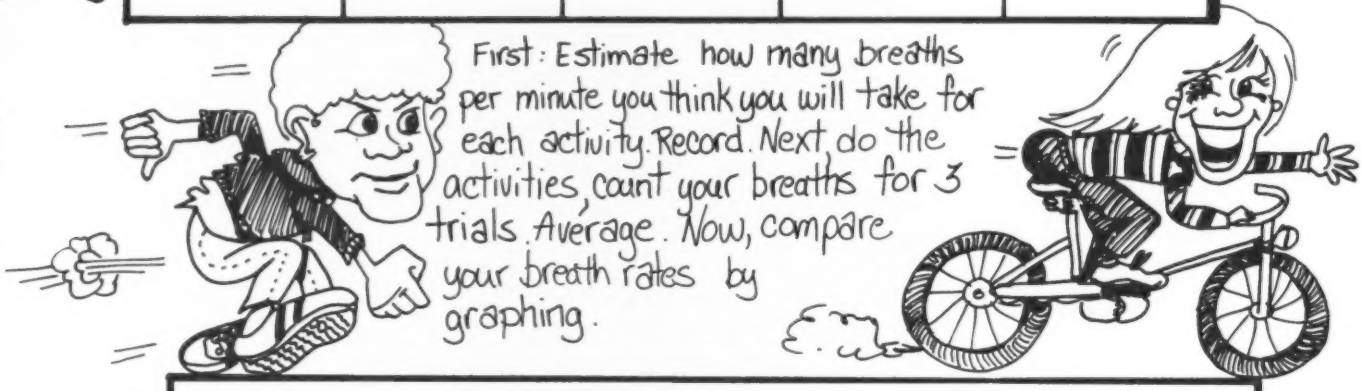
_____ name

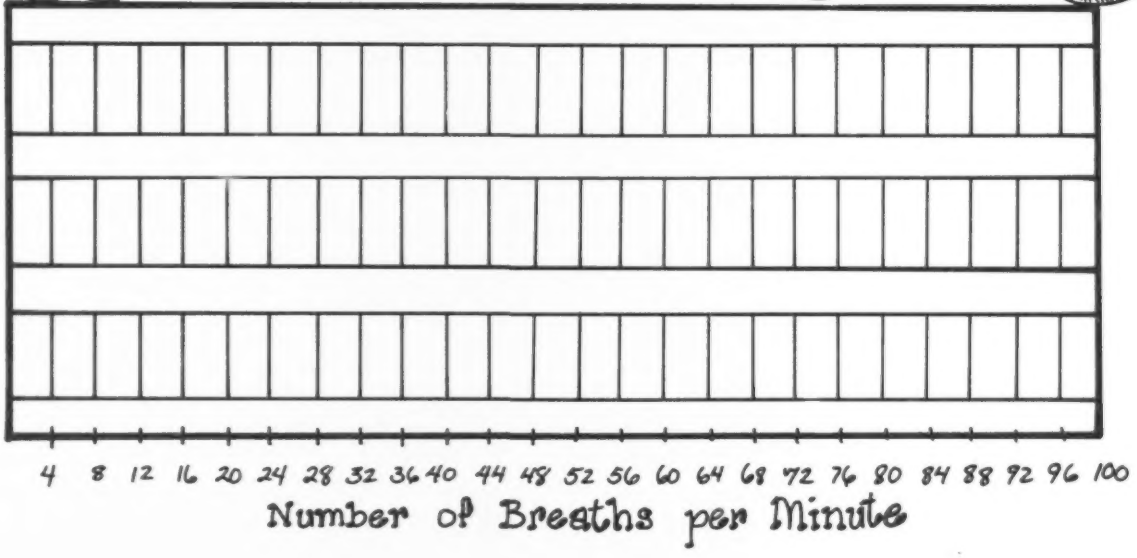
You Take My Breath Away

Data Table for Number of Breaths per Minute

	Estimate	Trial 1	Trial 2	Trial 3	Average
Sitting					
Jogging					
Cycling					



First: Estimate how many breaths per minute you think you will take for each activity. Record. Next do the activities, count your breaths for 3 trials. Average. Now, compare your breath rates by graphing.



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CLASS AVERAGE

	NAME	
1.		
2.		
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31.		
32.		
33.		
34.		
35.		
	CLASS TOTAL	
50.	CLASS AVERAGE	

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